ENVIRONMENTAL RESTORATION
RFCA STANDARD OPERATING PROTOCOL
FOR ROUTINE SOIL REMEDIATION
FY02 NOTIFICATION #02-09
IHSS GROUP 900-11
IHSS 112 – 903 DRUM STORAGE AREA

October 2002

1/85

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ACRONYMS AND ABBRIEVATIONS

903 Pad	903 Drum Storage Area
AL	action level
ALARA	as low as reasonably achievable
ARAR	applicable or relevant and appropriate requirement
BMP	best management practice
BZ	Buffer Zone
BZSAP	Buffer Zone Sampling and Analysis Plan
CCR	Code of Colorado Regulations
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CHWA	Colorado Hazardous Waste Act
COC	contaminant of concern
cy	cubic yard
D&D	Decontamination and Decommissioning
ER	Environmental Restoration
ER RSOP	Environmental Restoration RSOP for Routine Soil Remediation
FY	Fiscal Year
IHSS	Individual Hazardous Substance Site
IM/IRA	Interim Measure/Interim Remedial Action
IMP	Integrated Monitoring Plan
K-H	Kaiser-Hill Company, L.L.C.
LDR	Land Disposal Restriction
LLW	low-level waste
PAC	Potential Area of Concern
pCi/g	picocuries per gram
pCi/L	picocuries per liter
PCOC	potential contaminant of concern
POC	Point of Compliance
POE	Point of Evaluation
RCRA	Resource Conservation and Recovery Act
RFCA	Rocky Flats Cleanup Agreement
RFETS	Rocky Flats Environmental Technology Site
RSOP	RFCA Standard Operating Protocol
SID	South Interceptor Ditch
SOR	sum of ratios
µg/kg	micrograms per kilogram
VOC	volatile organic compound

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1.0 INTRODUCTION

This Environmental Restoration (ER) Rocky Flats Cleanup Agreement (RFCA) (DOE et al. 1996) Standard Operating Protocol (RSOP) for Routine Soil Remediation (ER RSOP) (DOE 2002a) Fiscal Year (FY) 02 Notification includes the notification to remediate Individual Hazardous Substance Sites (IHSSs) and Potential Areas of Concern (PACs) in the Rocky Flats Environmental Technology Site (RFETS) Buffer Zone (BZ) during FY02. Activities specified in the ER RSOP are not reiterated here; however, deviations from the ER RSOP are included where appropriate.

The purpose of this Notification is to invoke the ER RSOP for surface and near-surface soil with radionuclide contamination at IHSS Group 900-11, IHSS 112 – 903 Drum Storage Area (903 Pad). Volatile organic compounds (VOCs) present in subsurface soil in the 903 Pad area will be addressed through the 903 Lip Area Interim Measure/Interim Remedial Action (IM/IRA). It is not anticipated that soil with VOC concentrations greater than RFCA Tier I Action Levels (ALs) will be encountered during removal of radionuclide-contaminated soil.

Potential threats to human health and the environment were evaluated using a screening-level risk assessment in accordance with RFCA Attachment 4 (DOE et al. 1996) to determine potential human health and environmental risks posed by release sites. The results of this evaluation indicate certain risks to human health and the environment exist, and that accelerated actions, in accordance with the ER RSOP, may be warranted at these release sites.

Based on analytical data, contaminants of concern (COCs) in native soil at IHSS Group 900-11, IHSS 112 – 903 Pad include radionuclides (plutonium ranging from background to 152,000 picocuries per gram [pCi/g], americium ranging from background to 31,670 pCi/g, uranium-234 ranging from nondetect to 178 pCi/g, uranium-235 ranging from nondetect to 16.9 pCi/g, uranium-238 ranging from nondetect to 780 pCi/g), and VOCs (ranging from nondetect to 6,100 micrograms per kilogram [µg/kg]) (DOE 2000a) indicating that an accelerated action under the ER RSOP at IHSS 112 – 903 Pad is warranted.

2.0 IHSS GROUP 900-11

IHSS Group 900-11 includes IHSS 112 – 903 Pad. Its location is shown on Figure 1.

2.1 Contaminants of Concern

COCs at IHSS 112 – 903 Pad were determined based on data collected during previous studies (DOE 1992-2001, DOE 2000a, DOE 2001a). Radionuclides are present in the surface and near-surface soil at IHSS 112 – 903 Pad. VOC contamination is generally at depths associated with the deeper unsaturated zone and saturated zones (greater than 15 feet below ground surface). VOCs are not COCs for this accelerated action; however, if encountered they will be evaluated for potential removal. VOC contamination in soil will be addressed through the 903 Lip Area IM/IRA.

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Figures 2, 3, and 4 present existing surface and subsurface radionuclide analytical results above background plus two standard deviations for existing surface and subsurface soil for Native Soil Horizon 1 (approximately the first 6 inches of native soil beneath the asphalt and artificial fill), Native Soil Horizon 2 (native soil approximately 6 to 12 inches in depth beneath the asphalt and artificial fill), and Native Soil Horizon 3 (native soil approximately 12 to 18 inches in depth beneath the asphalt and artificial fill), respectively. Figures 5, 6, and 7 present the RFCA Tier I and Tier II radionuclide sum of ratios (SORs) for Native Soil Horizons 1, 2, and 3, respectively (DOE 2000a). The SOR is calculated for radionuclides detected above background activities. The SOR is the sum of the ratios of the result to the AL as described by the following equation:

$$SOR_{rads} = x_{Am-241}/y_{Am-241} + x_{Pu-239/240}/y_{Pu-239/240} + x_{U-233/234}/y_{U-233/234} + x_{U-235}/y_{U-235} + x_{U-238}/y_{U-238} \quad \text{(Equation 1)}$$

Where:

x = concentration/activity in soil

y = AL.

The SORs presented on these figures are calculated from all data, while Figures 2, 3, and 4 present only data greater than the background means plus two standard deviations.

The depth to the native soil horizons varies because the thickness of the artificial fill varies. Figure 8 presents a sketch of the 903 Pad asphalt, gravel, and native soil horizons and their correlation to surface and subsurface soil designations.

VOCs are present in subsurface soil at varying concentrations and depths, and are dispersed throughout the soil column from 5 to 20 feet in depth. Methylene chloride is present sporadically in concentrations greater than the RFCA Tier I AL. The concentration of methylene chloride generally increases with depth; however, it is not present continuously throughout the soil column. Tetrachloroethene is present in concentrations greater than the RFCA Tier I AL at one location where methylene chloride is also present (DOE 2000a). Methylene chloride, dichloroethene, and trichloroethene are present in the subsurface; however carbon tetrachloride, which was present in drums stored at the 903 Pad, has not been detected. The highest concentrations of VOCs are generally at depths greater than 15 feet below ground surface.

2.2 Project Conditions

The following conditions are present at this site:

- The 903 Pad measures 375 x 395 feet and is 3.4 acres in size (Figure 8).
- An asphalt pad (approximately 6 inches thick) covers the site (Figure 8).
- A layer of artificial fill (approximately 6 inches to the gravel base) is present beneath the asphalt pad (Figure 8).

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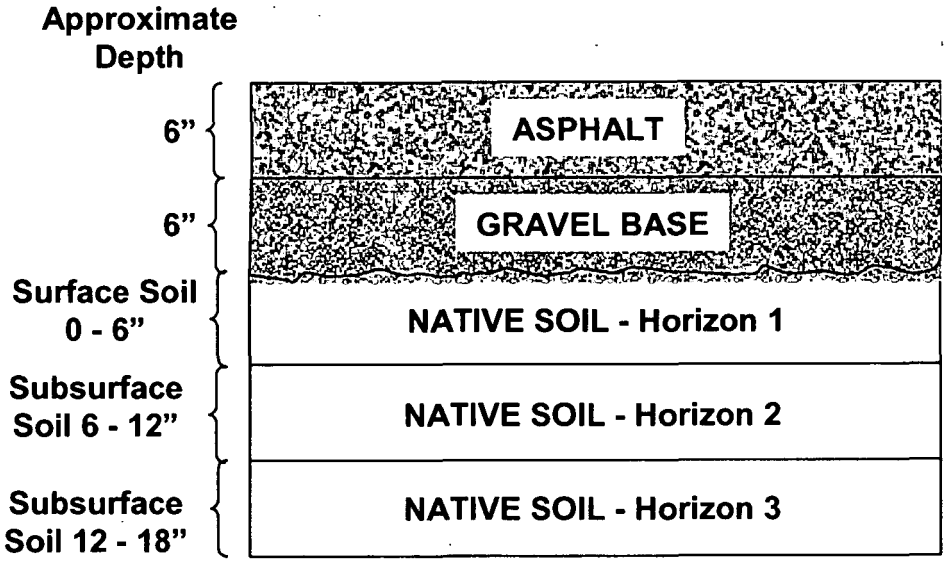
Figure 8
903 Pad Subsurface Cross Section



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- Radionuclides are present in the surface and shallow subsurface soil.
- VOCs are present, sporadically, in the subsurface soil.

2.3 Remediation Plan

In accordance with the ER RSOP, removal of radionuclide-contaminated soil with contaminant concentrations greater than RFCA Tier I ALs, by removing the depth of soil described herein, is required. Additionally, soil with contaminant concentrations between RFCA Tier I and Tier II ALs requires evaluation to determine whether action to remove or manage the soil is indicated.

The existing sampling data (Figures 2 through 7) indicate that all significant radionuclide contamination is within the top 12 inches of native soil with varying levels and depths. Results from all 25 sampling locations indicate that the maximum plutonium activity at depths greater than 12 inches in native soil is 48 pCi/g and is likely in the top of Native Soil Horizon 3. Therefore, using mechanical excavation equipment, the top 12 inches of native soil below the footprint of the pad will be removed (Figures 5 and 6 [DOE 2000a]). As a result of this action, it is anticipated that residual radioactivity in soil will be well below Tier II ALs and even approaching background levels (Figure 7 [DOE 2000a]). After the top 12 inches of native soil are removed, the stewardship and as low as reasonably achievable (ALARA) evaluations will be conducted, using the consultative process with the regulatory agencies, to determine whether additional excavation is required.

Soil excavation will be conducted within a 90- x 110-foot tent that will be used to protect the excavation from weather conditions and mitigate possible weather-related delays. Within the tent, the excavation area will be approximately 80 x 90 feet. Subareas will be established on a grid within the tent based on the reach of the excavating equipment and tent logistics. It is anticipated that there will be 9 or 16 subareas to a tent.

As excavation in the tent progresses, in-process confirmation samples will be collected from the approximate middle of each subarea. Upon receipt of in-process sample results, using gamma spectroscopy methods, the decision will be made (through the consultative process) to either remove another 6-inch lift of soil to achieve remediation goals, or to proceed with the backfill process. A confirmation sample will be collected in the location of the additional excavation. When excavation and backfill activities within the tent are complete, the tent will be moved to the adjacent excavation area. It is anticipated that the tent will be moved 20 times over the 903 Pad area.

Removal of deeper VOC-contaminated subsurface soil is not being proposed at this time and will be addressed through the 903 Lip Area IM/IRA because of the following reasons:

- The highest concentrations of VOCs are generally at depths greater than 15 feet below ground surface. Excavation of scattered VOC-contaminated soil pockets at this depth is impractical because VOCs tend to be mobilized by excavation, which may result in incomplete removal.

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- Stringent radiological work controls will be in place during the 903 Pad radiological accelerated action. Because the highest concentrations of VOCs are at or near the bedrock surface, large or deep excavations would be required. Deep excavation of VOC-only contaminated soil would not be practical or cost-effective under stringent radiological work controls.

- Groundwater from the 903 Pad area is captured on the north and east by the Mound and East Trenches barrier and treatment systems. Current data do not indicate that there is a pathway from groundwater to surface water on the south. Evaluation of potential VOC source removal will be conducted as part of the 903 Lip Area IM/IRA.

- VOC-contaminated subsurface soil can be properly evaluated and addressed comprehensively over the 903 Pad and Lip areas in the IM/IRA in conjunction with evaluation of groundwater and potential surface water impacts.

- There is no in-situ treatment option for 903 Pad soil contaminated with plutonium and americium; however, in-situ VOC treatment options (for example, application of compounds that accelerate degradation) may provide equivalent or better reduction in VOC concentrations with less risk to workers.

Based on existing data, it is not anticipated that VOC-contaminated soil will be encountered during this accelerated action. Six waste characterization grab samples were collected over the 903 Pad footprint, at a depth of 1 foot, at locations biased toward elevated analytical results or field indicators. All results were significantly below RFCA Tier I ALs and the soil is Land Disposal Restriction (LDR)-compliant. However, if VOC-stained soil is encountered, the consultative process will be used to determine if, and to what extent, VOC-contaminated soil will be removed at this time.

The proposed action for IHSS 112 – 903 Pad includes the following:

- Remove asphalt and dispose of as low-level waste (LLW) (approximately 2,743 cubic yards [cy]);

- Remove artificial fill to the base of the gravel (approximately 3,429 cy) and dispose of as appropriate, pending waste characterization;

- Remove the top 1 foot of native soil at the 903 Pad (approximately 6,858 cy) and additional soil as necessary to removal all soil with contaminant concentrations greater than RFCA Tier I ALs and as indicated by the ALARA and stewardship evaluations, and dispose of as appropriate, pending waste characterization;

- Collect confirmation samples in accordance with the Buffer Zone Sampling and Analysis Plan (BZSAP [DOE 2002b]) (Section 4.5); and

- Backfill with clean soil, regrade, and revegetate.

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2.4 Soil Removal Alternatives

Three alternatives were evaluated for the 903 Pad area: removal of approximately 1 foot of soil below the asphalt and artificial fill, stabilization/capping, and no action. These alternatives were compared against three evaluation criteria: effectiveness, implementability, and relative cost in accordance with RFCA Appendix 3, Implementation Guidance Document (DOE et al. 1999). Stewardship impacts have also been included in the evaluation. The results of this evaluation are summarized in Table 1.

The alternative selected for this accelerated action must be protective of human health and the environment. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) also requires that the selected cleanup alternative comply with applicable or relevant and appropriate requirements (ARARs) established under federal and state laws, to the extent practicable, or justify a waiver for the requirements. The removal action must be cost-effective and use technologies that result in a permanent action to the maximum extent possible.

The alternative analysis resulted in an alternative that is effective and implementable under the ER RSOP. The preferred alternative for the 903 Pad area is Alternative 1: removal of 1 foot of soil across the 903 Pad area and disposal offsite. Alternative 1, while not the most cost-effective option, provides overall protection of human health and the environment and compliance with ARARs. Alternative 2 also provides overall protection of human health and the environment but would require additional stewardship actions. Alternative 3 does not provide overall protection of human health and the environment. Alternatives 2 and 3 are less acceptable to the community.

2.5 Stewardship Evaluation

Based on the COCs (Section 2.1) and the ER RSOP (DOE 2002a), it is anticipated that all contamination above RFCA Tier I ALs will be remediated. It is also anticipated that most soil with contaminant concentrations greater than RFCA Tier II ALs will be removed with the top 1 foot of soil. The potential remediation area is shown on Figure 9. Additional remediation to below Tier I ALs is not required by RFCA, but will be evaluated using the consultative process. A map of residual contamination will be generated after remediation. The following sections contain the stewardship evaluation.

2.5.1 Proximity to Other Contaminant Areas

IHSS 112 – 903 Pad is located in the RFETS BZ. Nearby potential contaminant areas include IHSS 155 – 903 Lip Area, which also contains IHSS 140 – Hazardous Disposal Area. These sites, potential contaminants of concern (PCOCs), media of interest, proximity, and relationships to IHSS 112 – 903 Pad are listed in Table 2 and shown on Figure 9.

Table 1
Alternative Analysis

Alternative Description	Effectiveness	Implementability	Relative Cost	Stewardship Impacts
Alternative 1– Removal of 1 foot of soil across the 903 Pad area and disposal offsite	In the short term, there may be adverse impacts to surface water quality, an increase in fugitive dust emissions, and transportation of radioactive material. Approximately 398 shipments of LLW are anticipated. (See Section 13.0 of the ER RSOP.) Potential impacts to water and air would be temporary and controllable with mitigation measures as described in the Remediation Plan (Section 2.3). This alternative would be protective of public health and the environment in the long term because removal of 1 foot of soil across the 903 Pad area would result in residual contamination less than 50 pCi/g in all sections and close to background levels in most sections of the 903 Pad area. This alternative will achieve ARARs including the following: – National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities (40 CFR 61,	This alternative is technically feasible because removal would be implemented using standard construction equipment and staged in a weather protective tent. The tent would also provide mitigation measures for potential impacts to air and water quality. Offsite facilities exist for disposal of the radioactive waste that would be excavated during the action. This alternative is believed to be acceptable to the State and local communities.	Approximately $9,446,000	Removal could result in the following: – Decreased impacts to surface water from runoff; – Decreased monitoring requirements; and – Potential removal of institutional controls. Stewardship costs will be determined in the Long-Term Stewardship Plan.

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Alternative Description	Effectiveness	Implementability	Relative Cost	Stewardship Impacts
	subpart H); – Solid Waste Disposal Act (RCRA), CHWA (6 CCR 1007-2); and – Radiation Control (6 CCR 1007-1). Toxicity and mobility would be reduced because radionuclide-contaminated soil would be removed.			
Alternative 2– Stabilization/Capping	In the short term, there may be adverse impacts to surface water quality and an increase in fugitive dust emissions during stabilization and cap construction. This alternative would be protective of public health and the environment because stabilization would reduce surface soil dispersion and surface water runoff. Long-term effectiveness would require institutional controls. This alternative will achieve ARARs including the following: – National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities (40 CFR 61, subpart H);	This alternative is technically feasible because the cap construction uses standard construction and earth-moving equipment. Stabilization would be conducted using common mixing equipment, such as mixing injectors, rippers, and disk harrows. While technically feasible, this alternative would result in additional institutional controls for the 903 Pad area and increased monitoring either through additional monitoring stations or longer-term monitoring.	Costs for this alternative are likely to be less than Alternative 1 in the near term. However, this remedy would be less effective than Alternative 1 and would require additional long-term stewardship costs.	Stabilization/capping could result in the following: – Increased monitoring requirements including either additional monitoring stations or longer-term monitoring; – Increased long-term stewardship costs; and – Long-term institutional controls. Stewardship costs will be determined in the Long-Term Stewardship Plan.

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Alternative Description	Effectiveness	Implementability	Relative Cost	Stewardship Impacts
	– Solid Waste Disposal Act (RCRA), CHWA (6 CCR 1007-2); and – Radiation Control (6 CCR 1007-1). Mobility would be decreased because surface soil dispersion via wind erosion and surface water runoff would be reduced. The cap would reduce the migration of contaminants into subsurface soil by reducing the infiltration of surface water and directing surface water runoff away from the area. Stabilization would reduce contaminant mobility by reducing the potential for these contaminants to migrate as dust, become entrained with surface water runoff, or infiltrate further into subsurface soil.	While this alternative could be implemented, it would not be consistent with the comprehensive final remedy for radionuclides in near-surface soil at the Site or the likely removal action for surface soil in the 903 Lip Area. Stabilization additives and capping materials would likely increase the amount of soil that would require remediation in the future. Also, as presented in the VOC discussion (Section 2.3), the presence of radionuclides at current concentrations would be expected to complicate a response to the VOC plume. This alternative is not acceptable to the State or local communities.		
Alternative 3– No action	In the short term, there would be no increased adverse impact to water quality, fugitive dust emissions, or transportation of radioactive material because soil in the 903 Pad would not be disturbed. However, this	While technically feasible, no action could result in additional institutional controls for the 903 Pad area and increased monitoring	$0	No action could result in the following: – Increased monitoring requirements including either additional monitoring stations or longer term monitoring; – Increased long-term stewardship

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Alternative Description	Effectiveness	Implementability	Relative Cost	Stewardship Impacts
	alternative would not be effective for overall protection of public health and the environment in the long term, nor would ARARs be achieved, because "no action" would result in soil with radionuclide contaminant concentrations greater than Tier I ALs. Toxicity and mobility would not be reduced.	either through additional monitoring stations or longer-term monitoring. This alternative is not acceptable to the State or local communities.		costs; and – Long term institutional controls. Stewardship costs will be determined in the Long-Term Stewardship Plan.

Table 2
Other Potential Contaminant Sources for IHSS Group 900-11, IHSS 112 – 903 Pad

IHSS Group/IHSS	PCOCs/COCs	Media	Distance from IHSS Group 900-11, IHSS 112 – 903 Pad
900-11, IHSS 155 – 903 Lip Area	Radionuclides VOCs	Surface and Subsurface Soil Subsurface Soil	Adjacent to the east and south
900-11, IHSS 140 – Hazardous Disposal Area	Metals VOCs	Surface Soil Subsurface Soil	Approximately 128 feet to the southeast

IHSS 155 is the result of erosion and transport of plutonium by wind and water from IHSS 112 – 903 Pad. IHSS 140 was used for the destruction and disposal of reactive metals and other chemicals such as solvents.

2.5.2 Surface Water Protection

Surface water protection includes the following considerations:

Is there a pathway to surface water from potential erosion to streams or drainages?

Surface water runoff from the western end of the 903 Pad flows north and then west into the ditch south of Central Avenue where it is sampled at location GS39 (Figure 1). From GS39, surface flow is to the north to the South Walnut Creek Drainage. It is unlikely that contaminants from the 903 Pad will be distinguishable from other sources (Figure 1). Station GS39 also receives runoff from the area west of the 903 Pad including the 904 Pad. Runoff from the northeastern region of the 903 Pad flows east into a small ditch and eventually to a borrow ditch bordering the BZ road, east of the 903 Lip Area. Flow from the borrow ditch is routed through a culvert leading to surface water performance monitoring location SW055. Surface water flows from SW055 toward the South Interceptor Ditch (SID). Station SW055 receives runoff from the 903 Pad and Lip areas.

Do characterization data indicate there are contaminants in surface soil?

Table 3 lists radionuclide data (DOE 2000a) from IHSS Group 900-11, IHSS 112 – 903 Pad, along with background values and RFCA ALs for comparison. As shown in this table, americium-241 and plutonium-239/240 activities in surface and near-surface soil are greater than the RFCA Tier I AL. Additionally, the uranium-238 activity is greater than the RFCA Tier I AL in surface soil.

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Table 3
Surface and Near-Surface Soil Characterization Summary

Analyte	Maximum Result (pCi/g)	Background Mean Plus Two Standard Deviations (pCi/g)	Tier I AL (pCi/g)	Tier II AL (pCi/g)
Americium-241	31,670.00	0.0227	215	38
Plutonium-239/240	152,260.0	0.066	1,429	252
Uranium-233/234	178.0	2.253	1,738	307
Uranium-235	16.9	0.0939	135	24
Uranium-238	780.0	2	586	103

Do monitoring results from Points of Evaluation (POEs) or Points of Compliance (POCs) indicate there are surface water impacts from the area under consideration?

There are no POEs or POCs in the vicinity of IHSS 112 – 903 Pad. The closest surface water monitoring stations are GS39 and SW055. Monitoring data from GS39 and SW055 (DOE 1999a, 1999b, 2000b, 2000c, 2000d, 2000e, 2001b, 2001c, 2001d, 2001e, 2002c) are summarized in Table 4. Additional surface water monitoring stations designed to monitor surface water quality in the subbasins draining the 903 Area were installed through the Integrated Monitoring Program (IMP). New surface water stations include GS51, GS52, GS53, and GS54 (K-H 2001). Preliminary results indicate that plutonium-239/240 is present at a concentration of 0.43 picocuries per liter (pCi/L) and americium-241 is present at a concentration of 0.088 pCi/L in surface water at SW055. Results from the other new monitoring stations are not available because of drought conditions; there was no water to sample.

Table 4
Surface Water Results From GS39 and SW055

Analyte	Maximum Result (pCi/L)	Woman Creek ALs and Standards (pCi/L)	Walnut Creek ALs and Standards (pCi/L)
GS39			
Americium-241	0.083	0.15	0.15
Plutonium-239/240	0.64	0.15	0.15
Uranium (Total)	2.09	11	10
SW055 (May 24, 2002)			
Americium-241	0.088	0.15	0.15
Plutonium-239/240	0.43	0.15	0.15
Uranium - 238	0.063	NA	NA
SW055 (May 28, 2001 – May 24, 2002 composite)			
Americium-241	0.56	0.15	0.15
Plutonium-239/240	3.16	0.15	0.15

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Is the IHSS Group in an area with high erosion potential, based on the 100-Year Average Erosion Map?

While most of the 903 Pad area is flat-lying, the southeastern portion of IHSS 112 – 903 Pad is shown on the 100-Year Average Erosion Map (DOE 2002a) as being in an area subject to approximately 0.018 pound per square yard of detachment. Erosion in the area (the hill slope including the southeastern corner of the 903 Pad to the SID) could average approximately 0.880 tonne per hectare per year (DOE 2000f). Most of the erosion potential for this area is due to the slope south of the 903 Pad area. Erosion potential for most of the 903 Pad area is very low, while erosion potential for the southeastern corner increases slightly.

2.5.3 Monitoring

Monitoring includes the following considerations relating to radionuclides. VOC impacts will be addressed in the 903 Lip Area IM/IRA.

Do monitoring results from POEs or POCs indicate there are groundwater impacts from the area under consideration?

Groundwater monitoring results from wells in the 903 Pad area (DOE 1995) indicate that americium-241, plutonium-239/240, uranium-235, and uranium-238 activities are greater than RFCA Tier II ALs, and americium-241 activities are greater than the RFCA Tier I AL. Table 5 lists the maximum results from IHSS 112 – 903 Pad wells that exceeded RFCA Tier II ALs.

Table 5
Groundwater Exceedances Associated With IHSS Group 900-11, IHSS 112 – 903 Pad

Analyte	Maximum Result (pCi/L)	Tier I AL (pCi/L)	Tier II AL (pCi/L)
Americium-241	21.31	14.5	0.145
Plutonium-239/240	0.812	15.1	0.151
Uranium-235	1.5	101	1.01
Uranium-238	75.73	76.8	0.768

Groundwater quality in this area may have been impacted by radionuclide contamination from IHSS 112 – 903 Pad.

Can the impact be traced to a specific IHSS Group?

Radionuclides in groundwater monitoring wells at IHSS 112 – 903 Pad are similar to constituents detected above background means plus two standard deviations in subsurface soil near these sites.

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Are additional monitoring stations needed?

Wells 1587, 1687, 06591, 06691, 06791, 06891, 06991, 07191, 08891, 09091, 13091, 13191, 13291, and 50199 are being removed from the 903 Pad area because they are in, or near, the soil removal area or they will no longer provide relevant information. Well locations are shown on Figure 10. Two new wells, 90402 and 90502, were added to monitor remediation activities. Their approximate locations are shown on Figure 1. These wells will also be evaluated, after remediation, to determine whether they will be needed for long-term monitoring.

Can existing monitoring locations be deleted if additional remediation is conducted?

The monitoring stations will still be needed to detect VOC concentrations in groundwater.

2.5.4 Stewardship Actions and Recommendations

The stewardship actions and recommendations for IHSS 112 – 903 Pad are as follows:

- Use best management practices (BMPs) (Section 7.2 of the ER RSOP [DOE 2002a]) to control runon to the remediation area and runoff to nearby surface water during remediation, including excavation inside a weather tent.
- Implement near-term institutional controls until final closure and stewardship decisions are implemented, including the following:
  - Signs and barriers;
  - Restrictions on soil excavation; and
  - Soil excavations controlled through the Site Soil Disturbance Permit process.
- Implement long-term stewardship actions, including the following:
  - Review of groundwater and surface water monitoring stations near IHSS Group 900-112 when long-term monitoring options are evaluated;
  - Federal ownership; and
  - Land use restrictions to prevent soil excavation. Specific land use restrictions will be discussed in the Site Long-Term Stewardship Plan.

These recommendations may change based on in-process remediation activities and other future RFETS remediation decisions.

2.6 Accelerated Action Remediation Goals

ER RSOP remedial action objectives include the following:

1. Provide a remedy consistent with the RFETS goal of protection of human health and the environment;

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2. Provide a remedy that minimizes the need for long-term maintenance and institutional or engineering controls; and
3. Minimize the spread of contaminants during implementation of accelerated actions.

The accelerated action remediation goals for IHSS 112 – 903 Pad include the following:

- Remove asphalt and dispose of as LLW (approximately 2,743 cy);
- Remove artificial fill (approximately 3,429 cy) and dispose of as appropriate, pending waste characterization;
- Remove the top 1 foot of native soil at the 903 Pad (approximately 6,858 cy) and additional soil as necessary to removal all soil with contaminant concentrations greater than RFCA Tier I ALs and as indicated by the ALARA and stewardship evaluations and dispose of as appropriate, pending waste characterization;
- Evaluate remaining soil for additional removal through the consultative process using stewardship and ALARA considerations (Sections 5.4 and 5.5 of the ER RSOP [DOE 2002a]); and
- Backfill with clean soil, regrade, and revegetate.

2.7 Treatment

Not applicable.

2.8 Confirmation Sampling

Confirmation samples will be collected to determine whether accelerated action goals have been achieved. A 90- x 110-foot weather tent will be used to protect the excavation from weather-related delays. An estimated 20 areas (80 x 90 feet each) will be excavated within the tent. Subareas, either 9 or 16 to a tent, will be excavated and confirmation samples will be collected from the approximate middle of each subarea. This will result in at least 180 confirmation samples over the 903 Pad area. Because there may be some variation in the reach of the construction equipment and because of the tent structure, the exact size of the excavation subareas will be determined in the field.

2.9 Project-Specific Monitoring

Project-specific surface water and groundwater monitoring during remediation was planned through the yearly IMP process where additional monitoring is considered for Decontamination and Decommissioning (D&D) and remediation projects. Air monitoring will be conducted in accordance with the Performance Monitoring for Radionuclides: 903 Pad Remediation Project (IHSS 112 & 155) (K-H 2002). The Colorado Department of Public Health and Environment (CDPHE) will also conduct additional project-specific air monitoring, which will be described in the FY03 IMP.

2.10 RCRA Units and Intended Waste Disposition

Not applicable.

2.11 Administrative Record Documents

DOE, 1992-2001, Historical Release Reports for the Rocky Flats Plant, Golden, Colorado.

DOE, 1995, Final Phase II RFI/RI Report for Operable Unit 2, 903 Pad, Mound and East Trenches Area, Rocky Flats Plant, Golden, Colorado, December.

DOE, 1999, Rocky Flats Environmental Technology Site, Quarterly Environmental Monitoring Report, April - June 1999, Golden, Colorado, August.

DOE, 1999, Rocky Flats Environmental Technology Site, Quarterly Environmental Monitoring Report, July - September 1999, Golden, Colorado, November.

DOE, 2000, Characterization Report for the 903 Drum Storage Area, 903 Lip Area, and Americium Zone, Rocky Flats Environmental Technology Site, Golden, Colorado, June.

DOE, 2000, Rocky Flats Environmental Technology Site, Quarterly Environmental Monitoring Report, October - December 1999, Golden, Colorado, November.

DOE, 2000, Rocky Flats Environmental Technology Site, Quarterly Environmental Monitoring Report, January - March 2000, Golden, Colorado, May.

DOE, 2000, Rocky Flats Environmental Technology Site, Quarterly Environmental Monitoring Report, April - June 2000, Golden, Colorado, August.

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DOE, 2002, Buffer Zone Sampling and Analysis Plan, Rocky Flats Environmental Technology Site, Golden, Colorado, June.

DOE, CDPHE, and EPA, 1996, Rocky Flats Cleanup Agreement, Rocky Flats Environmental Technology Site, Golden, Colorado, July.

DOE, CDPHE, EPA, Kaiser-Hill, and RMRS, 1999 Rocky Flats Cleanup Agreement, Appendix 3 RFCA Implementation Guidance Document, July.

Kaiser-Hill Company, L.L.C, 2001, Project Plan for Surface Water Performance Monitoring of the 903 Drum Storage Area (IHSS 112) and Lip Area (IHSS 155) to Establish Baseline Surface Water Quality, Rocky Flats Environmental Technology Site, Golden, Colorado, July.

Kaiser-Hill Company, L.L.C., 2002, Performance Monitoring for Radionuclides: 903 Pad Remediation Project (IHSSs 112 & 155), Rocky Flats Environmental Technology Site, Golden, Colorado, May.

2.12 Projected Schedule

Remediation of IHSS 112 – 903 Pad is scheduled to begin in October 2002. It is anticipated that this project will take 6 months to complete.

3.0 PUBLIC PARTICIPATION

ER RSOP Notification #02-09 activities were discussed at several ER/D&D Status meetings. Additionally, the ER RSOP Notification was subject to a 30-day public review process. This Notification is available at the Rocky Flats Reading Rooms.

4.0 REFERENCES

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DOE, 2000f, Report on Soil Erosion and Surface Water Sediment Transport Modeling for the Actinide Migration Evaluations at the Rocky Flats Environmental Technology Site, Golden, Colorado, September.

DOE, 2001a, Draft Buffer Zone Data Summary Report, Rocky Flats Environmental Technology Site, Golden, Colorado, July.

DOE, 2001b, Rocky Flats Environmental Technology Site, Quarterly Environmental Monitoring Report, October - December 2000, Golden, Colorado, February.

DOE, 2001c, Rocky Flats Environmental Technology Site, Quarterly Environmental Monitoring Report, January - March 2001, Golden, Colorado, May.

DOE, 2001d, Rocky Flats Environmental Technology Site, Quarterly Environmental Monitoring Report, April - June 2001, Golden, Colorado, August.

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Kaiser-Hill Company, L.L.C, 200,1 Project Plan for Surface Water Performance Monitoring of the 903 Drum Storage Are (IHSS 112) and Lip Area (IHSS 155) to Establish Baseline Surface Water Quality, July.

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APPENDIX A
CORRESPONDENCE

STATE OF COLORADO

Bill Owens, Governor
Douglas H. Benevento, Acting Executive Director

Dedicated to protecting and improving the health and environment of the people of Colorado

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Colorado Department
of Public Health
and Environment

October 24, 2002

Mr. Joe Legare
Assistant Administrator for Environment and Infrastructure
U.S. Department of Energy-RFFO
10808 Highway 93, Unit A
Golden CO 80401-8200

RE: Comments on Draft Sampling and Analysis Plan Addendum #IA-03-01

Dear Mr. Legare:

The Colorado Department of Public Health and Environment has reviewed the above-referenced SAP Addendum and has attached comments to this correspondence.

If you have any questions please contact Carl Spreng at 303-692-3358 or Elizabeth Pottorff at 303-692-3429.

Sincerely,

Steven H. Gunderson
RFCA Project Coordinator
Colorado Department of Public
Health and Environment

cc: Reg Tyler, DOE
Dave Shelton, K-H
Marla Broussard, K-H
Tim Rehder, EPA
Dan Miller, AGO
Susan Chaki, CDPHE
Steve Tarlton, CDPHE-RFOU
Administrative Record, T130G

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Comments by the Colorado Department of Public Health & Environment
on the
DRAFT SAMPLING AND ANALYSIS PLAN ADDENDUM #IA-03-01
September 2002

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1. In order to be useful in determining new sampling locations, the figures showing the existing sampling results need to show all relevant locations, whether or not the results were greater than the levels of concern. Since decisions for these IHSS Groups will be based on the proposed new action levels, it is not useful and inappropriate to compare analytical data to current action levels.

2. Section 1.2
The IA SAP describes 2 sampling grid sizes in Sections 4.3.1 and 4.3.2. The "expanded grid" described in this section is intermediate in size. Rather than label these samples "biased", it would be simpler and more straightforward to propose this grid size in a modification to the IA SAP. Such a modification should include the basis for this grid size and the types of justification required for its application. Otherwise sufficient information needs to be provided to properly support the expanded grid for each specific IHSS included in this addendum. This needs to include properly demonstrating that the more limited number of samples to be collected with the expanded grid will achieve the 90% confidence level for each IHSS, and the rationale for the placement of these "biased" statistical locations.

3. Section 2.2
The proposed biased sampling to be conducted under the building, as shown on Figure 3, should be modified as relevant to provide for sampling associated with foundation drains, sewers, sumps, etc. Also, considering fluoranthene and pyrene were identified under the building on the west side, additional samples should be collected in this area (and at appropriate and/or greater depths), and another sample should be located adjacent to the building foundation next to the process waste line on the north side of B374.

4. Section 3
Figure 5 needs to include the locations of all sumps, drains, drain lines, sewer lines, and other infrastructure to determine if additional biased sampling will be required. Particularly because B441 was previously a laboratory, it cannot be determined if the proposed sample location grid is sufficient or properly located. In addition, it appears that more biased samples need to be located along the PWL under and immediately west of B441. There will also need to be additional samples collected to determine the extent of the currently identified contamination, unless this is to be addressed during the excavation of this contamination. The list of PCOCs for B441 should include SVOCs.

5. Section 4
Because the existing sample locations are not shown on the Figure 9, it cannot be determined if the proposed locations are sufficient to properly characterize the known or potential UBC. This is especially a concern since UBC has been identified under B771.

Comments by the Colorado Department of Public Health & Environment
on the
DRAFT SAMPLING AND ANALYSIS PLAN ADDENDUM #IA-03-01
September 2002

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1. In order to be useful in determining new sampling locations, the figures showing the existing sampling results need to show all relevant locations, whether or not the results were greater than the levels of concern. Since decisions for these IHSS Groups will be based on the proposed new action levels, it is not useful and inappropriate to compare analytical data to current action levels.

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4. Section 3
Figure 5 needs to include the locations of all sumps, drains, drain lines, sewer lines, and other infrastructure to determine if additional biased sampling will be required. Particularly because B441 was previously a laboratory, it cannot be determined if the proposed sample location grid is sufficient or properly located. In addition, it appears that more biased samples need to be located along the PWL under and immediately west of B441. There will also need to be additional samples collected to determine the extent of the currently identified contamination, unless this is to be addressed during the excavation of this contamination. The list of PCOCs for B441 should include SVOCs.

5. Section 4
Because the existing sample locations are not shown on the Figure 9, it cannot be determined if the proposed locations are sufficient to properly characterize the known or potential UBC. This is especially a concern since UBC has been identified under B771.

Figure 9 (as well as Fig 7) should also include the locations of all sumps and other low areas such as the elevator shaft, as well as the tunnel to B776, which should be included in this UBC activity. The limited number and placement of samples is of particular concern when the number and locations of previously proposed sampling are considered (see IASAP, Appendix B).

Table 6 - The limited number of PCOCs needs to be explained, i.e., why are VOCs and SVOCs excluded from most sampling locations? Most of these sites are associated with process waste tanks or lines, which may have included these contaminants, and numerous previous sample results include detections of these contaminants.

Table 7 - Considering all of the UBC samples are only to be from 0 to .5 feet, does this interval correspond to all of the previously identified contaminant depths? If so, then this needs to be explained in the text. If not, then additional samples may need to be collected at deeper intervals.

According to Figure 9 it appears only 4 UBC samples are to be collected for B774. This does not seem sufficient to properly characterize the potential UBC for this building. There should also be additional samples associated with the process waste lines.

6. Section 5

Table 8 - SVOCs have been identified in the adjacent soil samples, therefore this section needs to explain why no SVOCs are included in the PCOC list.
Figure 11 - The samples to be collected in B865 should be biased to sumps, drains, PWLs, floor seems or cracks, and other areas of concern. Also, additional samples should be collected for B866.

7. Section 6

The contaminated material was initially stored on the 904 Pad prior to erecting the tents. The tents were erected after spills had already occurred, therefore, the expanded grid may not be sufficient. Biased samples should be collected at previous spill locations if possible. Also, because previous runoff may have occurred prior to erecting the tents, this sampling event should also include soil samples adjacent to the initial edge of the pad.

APPENDIX B

RESPONSIVENESS SUMMARY

	City and County of Broomfield Comments, August 26, 2002	Response
	General Comments	
1	**Contaminants of Concern:** Broomfield is concerned DOE has not chosen to address VOCs as a contaminant of concern (COC) within the 903 ER RSOP notification. When an accelerated action is warranted for a specific Individual Hazardous Substance Site (IHSS), the remedial action objectives should be identified for the area as a whole and not deferred to another remediation document. Broomfield has become more sensitive to the practice of omitting VOCs and groundwater contaminated media when selecting a remedy for an IHSS because of two recent remedy decisions. Two recently proposed key remediation projects, the Present Landfill and the 903 Remediation, have chosen to defer groundwater issues associated with VOCs to a later phase. The Site has failed to identify which documents will capture the remediation of the groundwater, the chosen remedy of the groundwater, the schedule for implementation of the remedy, and proposed schedule the Site assumes the COCs will be protective of human health and the environment. The COCs are identified in the notification, but Table 2 identifies metal(s) as a potential constituent of concern (PCOC) or as a COC, but the metal(s) are not identified within the document, nor are they addressed.	Accelerated actions conducted in accordance with the ER RSOP are routine soil removal actions. VOCs are not addressed in the Notification because source removal may not be the appropriate action. Additionally, stringent radiological work controls will be in place during the 903 Pad radiological accelerated action. Because the highest concentrations of VOCs are at or near the bedrock surface, large or deep excavations would be required. Deep excavation of VOC-only contaminated soil would not be practical or cost-effective under stringent radiological work controls. The appropriate decision document for 903 Pad VOC remediation is the 903 Lip Area Interim Measure/Interim Remedial Action (IM/IRA). The IM/IRA will include groundwater remediation alternatives, the groundwater remedy, schedule, and supporting documentation. Table 2 identifies COCs for nearby potential contaminant sources, not IHSS 112 – 903 Pad. Metals were not identified as COCs at the 903 Pad.

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2	**Accelerated Remedial Action Goals:** The ER RSOP accelerated remedial action objectives (RAOs) are very broad and do not identify the specifics of the project. The Site has provided us with an explanation as to why the 50 pCi/g remediation level is not identified within the notification, but has not provided us with a process to ensure anything above 50 pCi/g within the first three feet of soil will be remediated. *The Draft Environmental Restoration RFCA Standard Operating Protocol for Routine Soil remediation FY 02 Notification #02-09 (903 Pad),* is the ninth notification Broomfield has received since the ER RSOP was approved. Each notification addresses the issue of evaluating remaining soil for additional removal through the consultative process using stewardship and ALARA considerations. Clarify the criteria for evaluating stewardship and ALARA considerations to determine if further remediation is or is not required. Identify the document that will include the details of the evaluation and consultative process. Broomfield does not intend to impede closure activities, but clearly wants to ensure consistency with the decision-making process that will impact long-term stewardship objectives.	The accelerated action goals (Section 2.6) are specific and state that the top 12 inches of native soil will be removed from the 903 Pad area. Additionally, the fourth goal states "Evaluate remaining soil for additional removal through the consultative process using stewardship and ALARA consideration (Sections 5.4 and 5.5 of the ER RSOP)". The text in Section 2.3 was changed to the following: "After the top 12 inches of native soil are removed, the stewardship and as low as reasonably achievable (ALARA) evaluations will be conducted, using the consultative process with the regulatory agencies to determine whether additional excavation is required." Stewardship and ALARA considerations are described in Sections 5.4 and 5.5 of the ER RSOP. Details of the post-remediation stewardship evaluation will be described in the Closeout Report.

3	**Independent Verification of Remedial Actions:** The document does not address independent (third party) verification of the effectiveness of remedial actions conducted during this project. Broomfield strongly believes an independent verification contractor would be able to verify the remedial action criteria have been effectively accomplished. Is it not the policy of the U.S. Department of Energy (DOE) to perform independent verification of remedial actions conducted under its purview?	The regulatory agencies will provide independent validation of sampling and analysis activities. A portion of the verification samples will be split with the U.S. Environmental Protection Agency (EPA) so they can confirm remediation goals were achieved. DOE, EPA, and the Colorado Department of Public Health and Environment (CDPHE) will be actively involved in project oversight.
4	**Air Performance Monitoring:** The document does not identify the ambient monitoring to be performed for performance monitoring. Identify the constituents to be monitored and what the action levels will be for the project.	Air monitoring will be conducted in accordance with the Performance Monitoring for Radionuclides: 903 Pad Remediation Project (IHSSs 112 & 155) (Kaiser-Hill 2002). This document has been provided under a separate cover. CDPHE will also conduct additional project-specific air monitoring, which will be described in the FY03 Integrated Monitoring Plan (IMP). This text has been added to Section 2.9.

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5	**Groundwater Performance Monitoring Wells**: Performance monitoring of source remediation is specifically required in the RFCA ALF for groundwater. Identify the wells, locations, and analytes being monitored for this project. Identify the post-remediation long-term monitoring associated with this project.	The well locations had not been determined at the time the Draft Notification was released for public comment. Since that time, the wells have been installed and were added to Figure 1. Analytes include VOCs, unfiltered plutonium, unfiltered americium, nitrate/nitrite, filtered uranium isotopes, and filtered metals. Post-remediation long-term monitoring associated with this project cannot be identified at this time. Short-term monitoring will be described in the IMP and long-term monitoring will be described in the Corrective Action Decision/Record of Decision (CAD/ROD).
	Specific Comments	
6	Page 1, Section 1.0, Introduction The introduction states deviations from the ER RSOP are included where appropriate within the document. The potential use of HRC to remediate the VOCs located at a depth of 4-5 feet in the northeastern section of the pad is not included in this document, nor is it in the ER RSOP. If HRC is utilized, either the ER RSOP will need to be revised or the *Draft Environmental Restoration RFCA Standard Operating Protocol for Routine Soil remediation FY 02 Notification #02-09* will need to be revised to capture this remediation activity.	VOCs will be addressed in the 903 Lip Area IM/IRA.

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7	Page 11, Section 2.3 Remediation Plan, Paragraph 2 Provide the rational as to why the confirmation samples will be collected from the approximate middle of each subarea. How does this sampling methodology compare to the proposed sampling methods in the approved Sampling and Analysis Plan (SAP)? If there is a deviation from the SAP, will a separate SAP be developed or will the SAP be revised? Broomfield does not expect the Site to perform additional confirmation analysis, but does expect the proposed method to be as comprehensive as the proposed confirmation method to ensure the remediation is successful. Per the proposal, if the tent is moved approximately 20 times and each tent movement will have 9-16 subareas, this method could lead to excessive confirmation samples being taken.	Soil will be excavated in subareas and confirmation samples will be collected in the approximate middle of each subarea. After sampling confirms that project objectives have been achieved, the subarea will be backfilled. This methodology will result in efficient excavation of the subarea and coincides with how the project will be managed. The confirmation sampling methodology is consistent with the Buffer Zone Sampling and Analysis Plan (BZSAP).

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8	Page 11, Section 2.3 Remediation Plan, bullet 3 The statement "Current data do not indicate that there is a pathway from groundwater to surface water on the south. Consequently, VOC source removal may not be necessary" presumes a sufficient evaluation has been performed. Provide the rational for this statement. Broomfield wants to emphasize the concern to defer groundwater remediation to a later phase or potentially not addressing the groundwater issue at all. Per maps provided to Broomfield and a conversation with Carl Spreng at an Environmental Restoration meeting, there may be groundwater migration from the 903 pad area to the southeast corner. At the D&D/ER meeting held on August 20, 2002, K-H stated the two new groundwater wells installed to monitor contaminants from the pad may not have sufficient water to analyze the contaminants. To resolve our concerns pertaining to VOC and groundwater contaminants, clarify the criteria used to consider why VOC source removal may not be necessary.	VOC source removal will be evaluated as part of the 903 Lip Area IM/IRA. The following text was deleted from Section 2.3, Bullet 3: "Consequently, VOC source removal may not be necessary." The following text was added: "Evaluation of potential VOC source removal will be conducted as part of the 903 Lip Area IM/IRA." Potential groundwater-to-surface water pathways will be evaluated in the 903 Lip Area IM/IRA. These wells have been appropriately placed to monitor groundwater from the 903 Pad. To date, the wells have been dry. It is anticipated that the wells will be sampled over the winter when precipitation increases. Because groundwater remedies are outside the scope of the ER RSOP and because the potential for a VOC source removal will be described in the 903 Lip Area IM/IRA, it is not appropriate to clarify the criteria in this Notification.
9	Page 11, Section 2.3 Remediation Plan, Paragraph 3, bullet 5 Clarify if in-situ VOC treatment options will be utilized for areas containing high levels of VOCs with the 4-5 foot depth range.	Please see response to Comment 8. VOC treatment options are not included in this Notification.

4/3

10	Page 12, Section 2.3 Remediation Plan, Paragraph 1 The document states: *However, if VOC-stained soil is encountered, the consultative process will be used to determine if and to what extent, VOC-contaminated soils will be removed at this time. If VOCs are found within the top 12 inches of soil, the VOC-contaminated soil will be segregated for waste disposal."* Per the remediation plan, soil within the top 12 inches of native soil below the footprint of the pad will be excavated. The two sentences are in conflict of the actions to be taken if VOCs are encountered. Clarify when VOC soils will be removed and what method will be in place to characterize the soil for VOCs during field remediation. Verify confirmation samples will also include analysis of VOCs and radionuclides.	If VOC-contaminated soil is encountered within the top 12 inches of native soil, it will be removed along with the radionuclide-contaminated soil. If VOC-stained soil is encountered below 12 inches, the consultative process will be used to determine if, and to what extent, this soil will be addressed during this action. Work control techniques will be used to determine whether VOCs are present in soil. Confirmation samples will be analyzed for radionuclides only, unless there is evidence that VOCs are present. The bullet in Section 2.3 regarding generation of low-level mixed waste was deleted. The last sentence of the fifth paragraph in Section 2.3 was also deleted.
11	Table 1 Alternative Analysis The document provided a detailed and sound approach to the stewardship impacts. Broomfield appreciates the efforts DOE has made to include local governments with the development of criteria for long-term stewardship.	No response is required.
12	Page 17, Section 2.5 Stewardship Evaluation A map of residual contamination will be generated after remediation per the document. How will the areas be identified? Will depths, volumes, and contaminant levels be identified in the closeout reports?	The areas of residual contamination will be based on analytical results greater than background means plus two standard deviations for radionuclides. The depth and contaminant level of the residual contamination will be identified in the closeout report.

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13	Page 17, Table 2 It would be helpful to identify the specific COCs and PCOCs. The media is identified, but the depths are not identified.	As discussed in the response to Comment 1, Table 2 describes the PCOCs at nearby potential contaminant sources. The purpose of this table is to identify nearby potential contaminant sources that could impact stewardship actions, not provide a detailed description of potential contamination at other IHSSs. Surface soil is defined as 0 to 0.5 feet (6 inches), subsurface soil is from 0.5 feet to the top of the water table or bedrock, whichever is shallower. (Please reference the BZSAP Data Quality Objectives, Section 3.1.)
14	Page 17, Section 2.5 Stewardship Broomfield would like to commend DOE on their stewardship evaluation. It was very helpful to see detailed tables, monitoring results, and sampling locations.	No response is required.
15	Page 21, Section 2.5.3 Monitoring, Paragraph 2 Two new wells are being added to monitoring groundwater quality in this area. Our concern is with the delay of placing the new wells and not having sufficient data to serve as a baseline for the remedial action. If remediation begins in October, the Site may or may not have pulled one sample. When new wells are drilled, what analytes are monitored to determine a baseline?	These wells were installed in July 2002 and their location was added to Figure 1. These wells are replacement wells for the ones removed from the 903 Pad. Baseline conditions have already been determined based on the data collected from the original 903 Pad wells. It is not anticipated that this 903 Pad remediation will affect groundwater quality. To date, the new wells have been dry. It is anticipated that the wells will be sampled over the winter when precipitation increases.

YS

16	Page 21, Section 2.5.4 Stewardship Actions and Recommendations Bullet 1 Run-on should also be addressed for best management practices (BMPs) to avoid additional management of contaminated water. Bullet 3 Add: Continue monitoring for radionuclides and/or VOCs.	Bullet 1: This text was changed to the following: "Use best management practices (BMPs) to control runon to the remediation area and runoff to …" Bullet 3: The long-term monitoring requirements have not been determined. They will be described in the Long-Term Stewardship Plan.

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17	Page 23, Section 2.6 Accelerated Action Remediation Goals What quality assurance program is in place to ensure the remediation objectives and goals are satisfied?	The ER Program Quality Assurance Program Plan (QAPP) incorporates the requirements of DOE Order 414.1A, *Quality Assurance*, and 10 Code of Federal Regulations (CFR) 830.120, *Quality Assurance Requirements*. Both the DOE Order and the regulation contain the same 10 quality criteria, which prescribe the quality standards necessary to meet the requirements of the RFETS Closure Contract. The QAPP describes how the ER Program will implement the 10 quality criteria. The Quality Assurance/Quality Control (QA/QC) requirements associated with ER work processes are presented in the QAPP. Specific requirements are described for sampling and analysis, radiological surveys, analytical chemistry and isotopics, and remedial activities. All final designs, documents, quality records, and computerized data will undergo validation through peer review, commensurate with the scale, cost, specialty, and hazards of the item or activity in question. Management approval, in addition to peer and quality review of designs, will be obtained prior to procurement, manufacture, construction, or field implementation. Peer and quality reviews will be corroborated through authentication of the design reviews in accordance with the *Site Engineering Process* (1-V51-COEM-DES-210). During implementation of remediation projects, management will conduct assessments that will be documented in formal QA reports and implemented in accordance with *K-H Management Assessment Program* (3-W24-MA-002). Personnel who are not directly responsible for the work being performed will perform independent assessments. Independent assessments will be performed in accordance with *Site Integrated Oversight Manual* (MAN-013-SIOM).

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18	Page 23, Section 2.8 Confirmation Sampling The rational for sampling in the middle of each subarea needs to be clarified. See comment number 2. Provide more information on the sampling methodology. Broomfield request a copy of the Sampling and Analysis Plan to review the Data Quality Objectives and rational for determining the sample location for each subarea.	Please see response to Comment 2. Copies of the BZSAP have previously been provided to the City and County of Broomfield.
	Rocky Flats Coalition of Local Governments Comments, August 29, 2002	
	General Comments	
19	The accelerated action remediation goals are listed for the 903 Pad in Section 2.6, and include removal of soil with contaminant concentrations greater than RFCA Tier I action levels (AL). We understand the difficulties of needing to comply with RFCA while anticipating changes to the radionuclide soil action level (RSAL) with the current RSAL review. Nevertheless, it is the Board's understanding that DOE intends to clean the 903 Pad subsurface to 50 pCi/g of plutonium, with a sum-of-ratios (SOR) less than one. Will the 903 Pad Notification be modified to reflect this cleanup goal once the end-state discussions are finalized? If not, where will this cleanup goal be captured?	The endstate discussions will not be finalized until RFCA is changed. It is anticipated that the Notification language will not need to be changed because the 903 Pad accelerated action will be well underway before RFCA is changed. The extent of cleanup will be documented in the closeout report.
20	Secondly, long-term stewardship considerations are an intrinsic part of each remedy, and we appreciate the efforts to which DOE has gone to include a stewardship evaluation in the ER RSOP. We are concerned, however, that the application of this stewardship analysis to the 903	The stewardship evaluation is a requirement of the ER RSOP. Because contamination, both radionuclide and VOC, at the 903 Pad is closely tied to contamination in the 903 Lip Area, a combined stewardship evaluation will be included in the 903 Lip Area IM/IRA with a more comprehensive stewardship evaluation

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	Pad Notification is quite thin and is a cut and paste from earlier ER RSOP notifications. While we recognize the specific level of cleanup will not be known until after remediation has been completed, we still believe that at the time the 903 Pad Notification is drafted the Site has a general idea of the target cleanup level. Thus, there should also be a general idea of the long-term controls that will be required. As is, it is not clearly stated in the 903 Pad Notification what the purpose of the long-term stewardship requirements are and what they are protecting. For instance, the only long-term actions cited in the 903 Pad Notification are the institutional controls of federal ownership and land use restrictions to prevent soil excavation, as well as the potential need for groundwater wells for long-term monitoring. There is no mention of the long-term need for physical controls, such as signs, to be used in conjunction with the institutional controls. Additionally, post-remediation long-term monitoring is not specifically addressed in the 903 Pad Notification (one sentence in Section 2.5.3 states that certain groundwater monitoring wells will be evaluated after remediation to determine if they will be needed for long-term monitoring). If, as the document states, land use restrictions will be required post-closure (Section 2.5.4), it can be inferred that there will be something to protect in the 903 Pad area after remediation. What interest are you trying to protect? Future user? Water quality? What contaminants will remain in sufficient quantities post-closure that will require monitoring? What is the pathway	and recommendations. Overall Site stewardship requirements will be addressed in the Long-Term Stewardship Plan. The residual contamination level at the 903 Pad or Lip Area will not be known until the remediation is complete. Without knowing residual contamination concentrations, neither long-term controls or specific monitoring requirements can be determined. Consequently, only general requirements and recommendations can be described at this time.

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	that long-term stewardship needs to protect? Furthermore, the post-remediation monitoring locations are not clearly outlined in the 903 Pad Notification. We understand the exact post-closure monitoring needs may not be known at this time. What, then, is the process and timeline for identifying monitoring program needs? Will these program needs be captured in the closeout report and how will they be enforced? There is also an important question from the stewardship and ALARA process overview in the ER RSOP (Figure 8 in the ER RSOP) missing from this stewardship evaluation, as well as the stewardship evaluations in all previous ER RSOP notifications. As per the ER RSOP, the stewardship evaluation in the notifications should also include the question, "Will additional engineered or institutional controls be needed after remediation?" These questions should be routinely considered with each stewardship evaluation to determine if additional remediation is warranted. As a final note, we believe the Stewardship Toolbox would be of great benefit in evaluating long-term stewardship actions in conjunction with the ER RSOP stewardship evaluation. DOE recognizes the Toolbox is a valuable resource and would help address issues such as the need for long-term physical controls and the purpose of long-term monitoring.	The evaluation of whether engineered controls will be required after remediation is part of the post-remediation stewardship evaluation.

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	Specific Comments	
21	Section 1.0 – Introduction In the fourth paragraph of this section, it is stated that plutonium, americium, and VOCs are contaminants of concern (COC) for the 903 Pad. As presented in Table 3 in the 903 Pad Notification, uranium is also present above Tier I ALs. Why is uranium not a COC for this accelerated action?	Plutonium and americium are the COCs that drive the 903 Pad remediation. While uranium is frequently detected across the 903 Pad, it is often, but not always, below background mean plus two standard deviations. The text has been changed to the following: "Based on analytical data, contaminants of concern (COCs) in native soil at IHSS Group 900-11, IHSS 112 – 903 Pad include radionuclides (plutonium ranging from background to 152,000 picocuries per gram [pCi/g], americium ranging from background to 31,670 pCi/g, uranium-234 ranging from nondetect to 178 pCi/g, uranium-235 ranging from nondetect to 16.9 pCi/g, uranium-238 ranging from nondetect to 780 pCi/g), and VOCs (ranging from nondetect to 6,100 micrograms per kilogram [µg/kg]) (DOE 2000a) indicating that an accelerated action under the ER RSOP at IHSS 112 – 903 Pad is warranted."
22	Section 2.1 – Contaminants of Concern In Figure 4 (Native Soil Horizon 3 Approximately 12" to 18" Existing Sampling Data Greater Than Background Plus 2 Standard Deviations), the maximum americium concentration appears to be around 9 pCi/g. As per the June 2000 "Characterization Report for the 903 Drum Storage Area, 903 Lip Area, and Americium Zone" (903 Pad Characterization Report), Section 4.2.1.3, the maximum radionuclide activity at depths greater than 12 inches of native soil is 54 pCi/g of americium (Am) in Native Soil Horizon 3. This concentration for americium is not in the 903 Pad Notification. Does the Site have newer data that show this hot spot does not currently exist?	As shown on Figure 4-13 of the Characterization Report for the 903 Drum Storage Area, 903 Lip Area and Americium Zone (DOE 1999), the Tier II americium exceedance in Native Soil Horizon 3 is in the Lip Area, east of the 903 Pad. This area will be addressed as a separate notification or as part of the 903 Lip Area IM/IRA.

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23	Section 2.3 – Remediation Plan 1) Paragraph 1 "In accordance with the ER RSOP, removal of soil with contaminant concentrations greater than RFCA Tier I ALs, by removing the depth of soil described herein, is required." If this sentence is true, VOCs must be remediated. Please clarify this sentence if it is not true. If the remedial action objectives (RAO) in the ER RSOP are not applicable, please caveat the above sentence in this Notification. Note this issue is also pertinent to Section 2.6 (Accelerated Action Remediation Goals), in which it is stated that the accelerated action remediation goals for the 903 Pad include removing all soil with contaminant concentrations greater than RFCA Tier I ALs.	This text has been changed to the following: " In accordance with the ER RSOP, removal of radionuclide-contaminated soil with contaminant concentrations greater than RFCA Tier I ALs, by removing the depth of soil described herein, is required."

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24	Section 2.3 – Remediation Plan 2) Paragraph 2 "Results from all of the 25 sampling locations indicate that the maximum plutonium radionuclide activity at depths greater than 12 inches of native soil is 48 pico curies per gram (pCi/g) and is likely in the top of Native Soil Horizon 3. Therefore, using mechanical excavation equipment, the top 12 inches of native soil below the footprint of the pad will be removed...." As mentioned earlier, the 903 Pad Characterization Report shows the maximum radionuclide activity at depths greater than 12 inches of native soil to be 54 pCi/g of americium (Am), in Native Soil Horizon 3. If, in fact, Am is present at 54 pCi/g from 12-18 inches below the surface, removing the top twelve inches of soil will not achieve an SOR of less than one, assuming a cleanup goal of 50 pCi/g of plutonium. If this area with elevated Am below 12 inches exists, will it be targeted for characterization and/or remediation to ensure a cleanup level of 50 pCi/g of plutonium with an SOR of less than one?	The text in Section 2.3, paragraph 2 was changed to the following: "After the top 12 inches of native soil are removed, the stewardship and as low as reasonably achievable (ALARA) evaluations will be conducted, using the consultative process with the regulatory agencies, to determine whether additional excavation is required." As shown on Figure 4-13 of the Characterization Report for the 903 Drum Storage Area, 903 Lip Area and Americium Zone (DOE 1999). the Tier II americium exceedance in Native Soil Horizon 3 is in the Lip Area, east of the 903 Pad.

25	Section 2.3 – Remediation Plan 3) Paragraph 3 "Soil excavations will be conducted within a 90-foot x 100-foot tent that will be used to protect the excavation from weather conditions and to mitigate possible weather-related delays." It is our understanding that an important function of the tents will be to protect against the further spread of contamination during remediation, as well as protect the excavation and mitigate weather-related delays. Will the tents protect against the further spread of contamination? If not, what steps will be taken to ensure contamination is not spread?	The spread of contamination will be prevented by work controls and BMPs. The function of the tent is to provide weather protection and allow safe working conditions during adverse weather conditions. However, further mitigating the spread of contamination is an additional benefit.

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25	Section 2.3 – Remediation Plan 3) Paragraph 3 "Soil excavations will be conducted within a 90-foot x 100-foot tent that will be used to protect the excavation from weather conditions and to mitigate possible weather-related delays." It is our understanding that an important function of the tents will be to protect against the further spread of contamination during remediation, as well as protect the excavation and mitigate weather-related delays. Will the tents protect against the further spread of contamination? If not, what steps will be taken to ensure contamination is not spread?	The spread of contamination will be prevented by work controls and BMPs. The function of the tent is to provide weather protection and allow safe working conditions during adverse weather conditions. However, further mitigating the spread of contamination is an additional benefit.

26	Section 2.3 – Remediation Plan 4) Paragraph 4 Bullet 3: "Groundwater from the 903 Pad is captured on the north by the Mound and East Trenches barrier and treatment systems. Current data do not indicate that there is a pathway from groundwater to surface water on the south." Does contaminated groundwater flow to the east of the Pad? Is it captured? If not, is there a pathway to surface water? If there is a pathway to surface water, is the surface water quality degraded by the groundwater from the 903 Pad? What measure of confidence does the Site have that it can meet existing RFCA water quality standard?	The following text was added: "Evaluation of potential VOC source removal will be conducted as part of the 903 Lip Area IM/IRA."
27	Section 2.3 – Remediation Plan Bullet 3: "...VOC source removal may not be necessary.'" This statement seems presumptuous at this early stage in the remediation planning process. We are concerned a push is being made by the Site to not remediate VOCs, although it does not appear that a sufficient evaluation has been conducted. There are many factors to consider when determining if VOC remediation will be necessary, and we do not believe sufficient information exists at this point to make that determination.	The following text was deleted from Section 2.3, Bullet 3: "Consequently, VOC source removal may not be necessary." The following text was added: "Evaluation of potential VOC source removal will be conducted as part of the 903 Lip Area IM/IRA."

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28	Section 2.5.2 – Surface Water Protection 1) Paragraph 3 "The closest surface water monitoring station is GS39...." Where is GS39? How close is it to the 903 Pad? From which other IHSSs does GS39 receive runoff? Will the 903 Pad be distinguishable as a separate source if elevated concentrations of a contaminant are detected at GS39 at some point in the future?	The locations of GS39 and SW055 have been added to Figure 1. The text in the first paragraph has been changed to the following: "It is unlikely that contaminants from the 903 Pad will be distinguishable from other sources (Figure 1). Station GS39 also receives runoff from the area west of the 903 Pad including the 904 Pad. Runoff from the northeastern region of the 903 Pad flows east into a small ditch and eventually to a borrow ditch bordering the BZ road, east of the 903 Lip Area. Flow from the borrow ditch is routed through a culvert leading to surface water performance monitoring location SW055. Surface water flows from SW055 toward the SID. Station SW055 receives runoff from the 903 Pad and Lip areas."
29	Section 2.5.3 – Monitoring In Table 5 (Groundwater Exceedances Associated With IHSS Group 900-11, IHSS 112-903 Pad), the maximum result for Am-241 is shown as 21.32 pCi/L, well above the Tier I AL for groundwater (14.5 pCi/L). The maximum result for plutonium (0.812 pCi/L), on the other hand, is much less than the Tier I AL for groundwater (15.1 pCi/L). Why is the Am result so high? As per most available data from the Site, Am is generally associated with plutonium (Pu) and thus takes on the characteristics of Pu, which is mostly insoluble. Does this more soluble Am negatively impact surface water?	These data are taken from Table 4.4-3 from the RFI/RI report for Operable Unit 02 (DOE 1995). These are the filtered radionuclide results. The unfiltered results indicate that plutonium-239/240 and americium-241 ratios are correct (approximately 7:1). This suggests that the filtered sample was contaminated. Further evaluation of data from well 09091, where the 21.32 pCi/L americium activity was reported, indicates that this an isolated occurrence. This well was not correctly screened at the surface when installed and the sample was likely contaminated. Additionally, the latest results from this well (1995) indicated that americium activity was 1.4 pCi/L and plutonium-239/240 activity was 12 pCi/L.

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	Additional Comments	
30	To the extent that the 903 Pad Notification has long-term value in the face of changing personnel onsite post-closure, it is important to have certain fundamental information in the document. For instance, in Section 2.3 (Remediation Plan), paragraph 4, it is stated that "the highest concentrations of VOCs are at or near the bedrock surface." As per the 903 Pad Characterization Report, it appears a significant pocket of VOCs resides in the northeastern corner of the Pad, with some Tier I exceedances less than four feet deep. Does this pocket of VOCs still exist? If so, its existence should be noted in the 903 Pad Notification. If not, please acknowledge the pocket's degradation/migration in this Notification to eliminate potential confusion.	VOC concentrations in soil have not been recharacterized since the 903 Pad Characterization Report. VOCs will be included in the 903 Lip Area IM/IRA.
31	Additionally, in Section 2.5 (Stewardship Evaluation), the document states, "It is also anticipated that after 1 foot (depth) of soil is removed, most contamination above RFCA Tier II ALs will be remediated." Does this sentence mean that more soil will be remediated after 1 foot of soil is removed to remove soil above Tier II ALs, or that removal of the top 1 foot of soil will result in most soil above Tier II ALs being removed? Although someone intimately involved with Rocky Flats will know what is meant by this sentence, someone less familiar now and in future years may not.	Removal of the top 1 foot of soil will likely result in the removal of all soil with contaminant concentrations greater then RFCA Tier II ALs. This text has been changed to the following: "It is also anticipated that most soil with contaminant concentrations greater than RFCA Tier II ALs will be removed with the top 1 foot of soil."

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32	Also, in Section 2.5.2 (Surface Water Protection), paragraph 2, it is written that " uranium-238 activity is greater than RFCA Tier II ALs in surface soil." As per Table 3 in the 903 Pad Notification, the maximum result for U-238 is 780 pCi/g, which is greater than both the Tier II (103 pCi/g) and Tier I (586 pCi/g) ALs. Please clarify in the document whether or not the high uranium concentration will be addressed by the proposed remedial actions.	As shown on Figures 2, 3, and 4, the uranium-238 activity of 780 pCi/g is within the top 6 inches of soil. Removal of the top 12 inches of soil will result in uranium-238 activities much less than RFCA Tier II ALs in soil below the top 12 inches. The text was changed to the following: "Additionally, uranium-238 activity is greater than the RFCA Tier I AL in surface soil." Because uranium has been added to the COCs in Section 1.0, it does not need to be specifically addressed in Section 2.5.2.
33	Lastly, it would be helpful to list the depths at which the maximum surface and near-surface soil characterization results are found in Table 3 (Surface and Near-Surface Soil Characterization Summary). While this information can be found in Figures 2, 3, and 4, it would be helpful to include it in the table as well so that someone looking back at the document will be better able to tell how much contamination was targeted by the remediation.	We believe the data as presented on the maps are adequate.

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	Rocky Flats Citizens Advisory Board Comments September 5, 2002	
34	Remedial Action Objectives: Concern: Under DOE's end state proposal, all surface soil contaminated with plutonium above a level of 50 pCi/g would be remediated. Yet, the 903 Pad ER RSOP Notification states that the goal of the project will be remediation to the 1996 Tier I action level of 651 pCi/g. Borehole sampling results from previous investigations indicate there may be areas of the pad that would not be subject to remediation if the cleanup goal is 651 pCi/g. Comment: It should be explicitly stated in this notification that the cleanup goal of the 903 Pad Project shall be consistent with DOE's end state proposal.	The goals are correct as stated – remediation of the top 1 foot of soil, along with stewardship and ALARA evaluations. DOE and Kaiser-Hill believe that the action, as stated, will be consistent with the new endstate.

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35	Postponing the decision on Volatile Organic Compounds (VOCs): Concern: This notification does not address VOCs as a contaminant of concern. Comment: RFCAB is concerned that by deferring a decision on VOCs, DOE is at risk of leaving behind soil contaminated with VOCs that will have to be remediated later on. Due to the cost of mobilizing a remediation team, this seems to be a highly inefficient approach. DOE should analyze the problem up front and know what it plans to do with the VOCs before the radiological remediation commences. If there is a highly concentrated source of VOCs underlying the 903 Pad, RFCAB recommends that it be removed or treated in order to reduce the long-term operations, maintenance and monitoring costs associated with the Mound/East Trenches Passive Groundwater Treatment Systems.	The 903 Pad Notification does not include remediation of VOC-contaminated soil because the VOCs can be more appropriately evaluated and addressed comprehensively over the 903 Pad and Lip areas in an IM/IRA. As shown on the groundwater plume map (DOE 2002), VOCs at concentrations 100 times the maximum contaminant limit (MCL) extend east, well beyond the 903 Pad. The VOCs are scattered throughout the soil column and around the 903 Pad area. The highest concentrations of VOCs are at or near the bedrock surface. Excavation of scattered VOC-contaminated soil pockets at this depth is impractical because VOCs tend to be mobilized by excavation and may result in incomplete removal. Additionally, deep excavations result in increased worker health and safety considerations. Also please see response to Comment 1.

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	Colorado Department of Public Health and Environment Comments, August 30, 2002	
36	**Section 1.0, Introduction, 2nd paragraph.** Statements on VOCs beg the questions of: • What are considered to be 'significant concentrations' with regard to VOCs? • What is the contingency should 'significant concentrations' of VOCs be encountered? Please incorporate discussion on representative values for 'significant concentrations' of VOCs e.g., greater than Tier I or Tier II and a contingency scenario to manage such VOC concentrations in soil to be excavated. *Response: VOCs will be addressed in an IM/IRA.* *CDPHE Response to Response: Original comment needs to be incorporated for end user understanding on what 'significant' represents.*	This text was changed to the following: "It is not anticipated that soil with VOC concentrations greater than RFCA Tier I ALs will be encountered during removal of radionuclide-contaminated soil."
37	**Section 2.1, Contaminants of Concern**. The list needs to be consistent with that presented in the 903 Pad Characterization Report and include identification of the radionuclides and VOC constituents. *Response: The COCs are sufficiently described for radionuclide remediation purposes.*	Please see response to Comment 21.

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38	**Section 2.1, Contaminants of Concern.** Revise the last 2 sentences of the first paragraph to read: "Although VOCs are COC's for the 903 Pad area, the VOC contamination is generally at depth associated with the *deeper unsaturated zone* and saturated zone (*greater than 15* feet bgs), which are beyond the scope of this accelerated action. Therefore, VOC contamination in the *unsaturated* zone is deferred to remedial action under the 903 Pad Lip area. However, should VOC contaminants at elevated concentrations or visible staining be encountered during this accelerated action, such would be evaluated for potential removal (see Section 2.3 for further discussion)." *Response: VOCs are not restricted to below 15 feet. A reference to the data source has been added.* CDPHE Response to Response: Comment needs to be incorporated to link to future efforts for VOC contamination in the unsaturated zone < 15 feet and the upper unsaturated and saturated zones. See added 'unsaturated' in original comment. Revise the last 2 sentences of the first paragraph to read: "Although VOCs are COC's for the 903 Pad area, the VOC contamination is generally at depth associated with the deeper unsaturated zone ~~vadose~~ and saturated zone (-greater than ~~average~~ 15 feet bgs), which are beyond the scope of this accelerated action. Therefore, VOC contamination in the unsaturated ~~vadose~~ and saturated zones is deferred to remedial action under the 903 Pad Lip area. However, should VOC contaminants at elevated concentrations or visible staining be encountered during this accelerated action, such would be evaluated for potential removal (see Section 2.3 for further discussion)."	VOCs are not COCs for this action. As discussed during the consultative process, extensive information on potential VOC contamination is not appropriate in this Notification. The last two sentences of the first paragraph were revised as follows: "VOC contamination is generally at depths associated with the deeper unsaturated zone and saturated zones (greater than 15 feet below ground surface). VOCs are not COCs for this accelerated action; however, if encountered they will be evaluated for potential removal. VOC contamination in soil will be addressed through the 903 Lip Area IM/IRA." Also, please see responses to Comments 1 and 10.

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39	**Section 2.1, Contaminants of Concern.** The last sentence of the second paragraph makes reference to Figure 8 (subsurface cross-section), which is actually Figure 9. Suggest that the Figures be switched in order to flow with presentation of information. *Response: Done*	No additional response is required.
40	**Section 2.1, Contaminants of Concern**. Paragraph 3 requires reference to supporting documentation if there is no intent to present a summary of the VOC data. To address community and agency concerns regarding VOCs, CDPHE suggests incorporation of a summary of VOC results found in the unsaturated interval (less than 15 feet) with comparison to the Tier I and Tier II soil action levels. This could be used as a basis for consultative process should VOC contamination be encountered at levels of concern during implementation of this accelerated action. *Response: The VOC data is not presented because the accelerated action is for radionuclides in surface and shallow subsurface soil only.*	No additional response is required.

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41	The last 2 sentences of paragraph 3 are presumptive statements that should be removed. *Response: These sentences were removed and the following text was added "Methylene chloride, dichloroethene, and trichloroethene are present in the subsurface, but carbon tetrachloride, which was present in drums stored at the 903 Pad, has not been detected. The highest concentrations of VOCs are below the water table and may be at the bedrock contact."* CDPHE Response to Response: We agree with the added text.	No additional response is required.
42	**Figures 4, 5, 6.** Add to the legend or in the text the representative sum of ratio value for Tier I and Tier II. *Response: This request is not clear.* CDPHE Response to Response: Add a note to Figures 5 and 6 that a sum of ratio value > 1 indicates an exceedance of Tier 1 or Tier 2.	The SOR is not a RFCA Tier I or Tier II exceedance. The following text has been added to Section 2.1: "The SOR is calculated for radionuclides detected above background activities The SOR is the sum of the ratios of the result to the AL as described by the following equation: $SOR_{rads} = x_{Am-241}/y_{Am-241} + x_{Pu-239/240}/y_{Pu-239/240} + x_{U-233/234}/y_{U-233/234} + x_{U-235}/y_{U-235} + x_{U-238}/y_{U-238}$. Where: x = concentration in soil, y = action level." The legend in Figures 5, 6, and 7 was changed to the following: Exceeds Tier I SOR and Exceeds Tier II SOR.

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43	**Section 2.2, Project Conditions.** • Provide a reference to Figure 8 (903 Pad Subsurface Cross Section), once Figure number is corrected from Figure 9 to Figure 8. *Response: Done* CDPHE Response to Response: We do not see that comment was addressed. Please add to third bullet.	The figure number was corrected and correlation to surface and subsurface soil and associated depth was added to Figure 8. Figure 8 is referenced in Section 2.1 and the following text was added to the reference: " asphalt, gravel, and native soil horizons and their correlation to surface and subsurface soil designation." The reference to Figure 8 was added to the first, second, and third bullets.
44	**Section 2.2, Project Conditions** • Add the dimensions of the site. *Response: Done* CDPHE Response to Response: We do not see that comment was addressed. Please add to first bullet.	The following text has been added "measures 375 by 395 feet and…"
45	**Section 2.2, Project Conditions** • Indicate that the native soil horizons presented in Figure 8 represent the surface and shallow subsurface soil intervals. *Response: Done* CDPHE Response to Response: We do not see that comment was addressed. Indicate that the native soil horizons presented in Figure 8 represent the surface and shallow subsurface soil intervals <u>to clarify cross-reference to use of terms surface/subsurface soil as related to the use of the terms soil horizons.</u>	The surface soil depths are directly correlated to Native Soil Horizon 1, and the two subsurface soil depths are directly correlated to Native Soil Horizons 2 and 3 on Figure 8. The following text has been added to Section 2.1 at the reference to Figure 8: " …903 Pad asphalt, gravel, and native soil horizons and their correlation to surface and subsurface soil designations."

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46	**Section 2.2, Project Conditions** • Suggest replace the last bullet with: "VOCs are present in the saturated zone (*about* 15 to 20 feet bgs), and *increase with depth* in the unsaturated zone (0 to 15 feet bgs) mainly in two areas respectively on the east central and west central part of the asphalt covered area." *Response: EPA requested the detail.* CDPHE Response to Response: Response is not clear. We do not see that comment was addressed.	The language currently provided was agreed to through the consultative process during document development. These concerns are addressed in response to Comment 38.

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47	**Section 2.3, Remediation Plan.** Paragraph 3 suggest the following revision: "Soil excavation will be conducted within a 90-foot by 110-foot tent used to protect the excavation from weather conditions and to mitigate possible weather-related delays. The excavation area within the tent will be approximately 80 feet by 90 feet. Subareas will be established on a grid within the tent based on the reach of the excavating equipment and tent logistics. It is assumed there will be 9 to 16 subareas per tent location. As excavation in the tent progresses, confirmation samples will be collected from the approximate middle of each subarea. Upon receipt of in-process sample results, using gamma-spec methods, the decision will be made to either remove another 6-inch lift of soil to achieve remediation goals, or to proceed with backfill process. When excavation and backfill activities within the tent are complete, the tent will be moved to the adjacent excavation area. It is anticipated that the tent will be moved 20 times over the 903 Pad Area."	No additional response is required.

	Response: The text was changed to the following: 'Soil excavation will be conducted within a 90-foot x 110-foot tent that will be used to protect the excavation from weather conditions and to mitigate possible weather-related delays. Within the tent, the excavation area will be approximately 80 feet x 90 feet. Subareas will be established on a grid within the tent based on the reach of the excavating equipment and tent logistics. It is anticipated that there will be nine or sixteen subareas to a tent depending on the reach of the excavating equipment and tent logistics. As excavation in the tent progresses, confirmation samples will be collected from the approximate middle of each subarea. Upon receipt of in-process sample results, using gamma-spec methods, the decision will be made (through the consultative process) to either remove another 6-inch lift of soil to achieve remediation goals, or to proceed with backfill process. When excavation and backfill activities within the tent are complete, the tent will be moved to the adjacent excavation area. It is anticipated that the tent will be moved 20 times over the 903 Pad area." CDPHE Response to Response: Thank you.	

48	**Section 2.3, Remediation Plan.** Considerations for the VOC discussion. • Instead of referencing the highest VOC concentrations near the bedrock surface, reference that they are present in the vadose and saturated zone at depths greater than 10-feet. Most people have no idea of where the bedrock surface is or what that really means, or add a depth of the bedrock surface for reference. *Response: VOCs are not restricted to below 15 feet. A reference to the data source has been added.* CDPHE Response to Response: CDPHE agrees that VOCs are not restricted to below 15 feet. See additional text added to original comment, for suggested addition of clarifying language. • Instead of referencing the highest VOC concentrations near the bedrock surface, reference that they are <u>generally</u> present in the <u>saturated zone and between the high and low water levels in the unsaturated zone but are limited in the upper unsaturated zone</u>. Most people have no idea of where the bedrock surface is or what that really means, or add a depth of the bedrock surface for reference.	Please see response to Comment 38.

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49	**Section 2.3, Remediation Plan.** Considerations for the VOC discussion. • Delete the third bullet discussing groundwater. The first part is correct as a statement. The latter is a huge assumption that needs to be addressed in the 903 Pad Lip Area IM/IRA. *Response: The third bullet states that "current data do not indicate" and does not imply that groundwater will never reach surface water.* CDPHE Response to Response: We realize that current data indicates no impact, but the statement on necessity of source removal needs to be deferred to the IM/IRA as part of that evaluation process. The IMP evaluation of ground water migration to surface water is not really complete in this area.	The following text was added: "Evaluation of potential VOC source removal will be conducted as part of the 903 Lip Area IM/IRA."
50	**Section 2.3, Remediation Plan.** Considerations for the VOC discussion • Suggest modification of the fourth bullet: "VOC-contaminated subsurface soil can be…" ***Response: Done***	No additional response is required.

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51	**Section 2.3, Remediation Plan.** Considerations for the VOC discussion • With regard to potential for addressing shallow subsurface VOC contaminated soils, suggest the following: Based on existing data it is not anticipated that VOC-contaminated soil at concentrations approaching Tier I or Tier II action levels will be encountered within the native soil horizons to 18-inches (the planned maximum depth of excavation). However, should field screening activities with a PID or FID or visual observation indicate the potential presence of VOCs beyond residual contamination, the consultative process will be implemented to determine if, and to what extent, VOC contaminated soil would be removed as part of this accelerated action. The purpose of such would be for source removal. *Response: This information will be available in work control documents.* CDPHE Response to Response: Provide a reference that the consultative process will be used and that work control documents contain details on a decision process, then provide information that language such as was suggested is indeed in the work control documents.	Section 2.3, paragraph 5, sentence 4 states that the consultative process will be used to determine whether additional VOC-contaminated soil should be removed.

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52	**Section 2.3, Remediation Plan.** The last part which summarizes the action to be taken, suggest the following: • Second bullet – indicate that the artificial fill is represented by the gravel base (to be consistent with the subsurface cross-section). ***Response: Done***	No additional response is required.
53	**Section 2.3, Remediation Plan.** The last part which summarizes the action to be taken, suggest the following: • Second bullet – Add what the artificial fill disposal decision is based on e.g., waste characterization data. *Response: Waste disposition for gravel may be through process knowledge or analytical data.*	No additional response is required.
54	**Section 2.3, Remediation Plan.** The last part which summarizes the action to be taken, suggest the following: • Third bullet – To be consistent with the first bullet indicate that the soil would likely be disposed of as low-level waste based on current data. *Response: Based on current data, some soil may be disposed as TRU waste.* CDPHE Response to Response: Thank you for the additions.	No additional response is required.

94

55	**Section 2.4, Soil Removal Alternatives.** For clarification on the alternatives, suggest the following modification: "Two alternatives were evaluated for the 903 Pad Area: (1) excavation of asphalt pad and approximately 1-foot of native soil, with backfill and revegetation, and (2) no action." Based on EPA comments and redline version, further adjustments would need to be made to cover this comment. *Response: The alternatives have been revised in accordance with EPA comments.* CDPHE Response to Response: Additions are appropriate and address our comment.	No additional response is required.
56	**Table 1, Alternative Analysis.** There are costs associated with monitoring, stewardship and implementation of institutional controls over x number of years. Nothing is ever free. *Response: True, but because the Long-Term Stewardship Plan has not yet been developed, the cost is difficult to quantify.* CDPHE Response to Response: Add To Be Determined in Long-Term Stewardship Plan.	The sentence "Stewardship costs will be determined in the Long-Term Stewardship Plan" was added to the Stewardship Impacts column in Table 1.
57	**Section 2.4.1, Stewardship Evaluation**. Suggest that this be changed to Section 2.5. Has nothing to do with the alternative analysis. ***Response: Done***	No additional response is required.

75

58	**Section 2.4.2, Proximity to Other Contaminant Areas.** Are there not subsurface and groundwater impacts emanating from the 903 Pad Lip Area. There is some historical data that indicates there are surface water impacts at SW055 (see George Squibb). *Response: There may be VOC impacts to groundwater, however, this Notification and Stewardship Evaluation pertain to radionuclide impacts. SW055 data is being discussed with the Surface Water Group and will be included in the IM/IRA.* CDPHE Response to Response: The impacts at SW055 are radionuclide based. It is unknown if there are VOC impacts, but that would need to be evaluated during the IM/IRA process.	No additional response is required.

76

59	**Section 2.4.3, Surface Water Protection.** Need to add a sentence indicating that "From GS39 surface flow is north through a culvert under Central Avenue into South Walnut Creek through SW022 and POE at GS10." Also need to add a sentence regarding the borrow ditch – "Flow from the borrow ditch is routed through a culvert leading to surface water performance monitoring location SW055. From SW055 surface water flows toward the SID." *Response: SW055 data is being discussed with the Surface Water Group.* CDPHE Response to Response: Response does not address the suggested inclusion of text to clarify where surface flows would be directed. Please revisit the original comment.	Surface water impacts from the 903 Pad to the Point of Evaluation (POE at GS10) cannot be distinguished from other Site sources. It does not appear necessary to include this information. However, the following text was added: "From GS39, surface flow is to the north to the South Walnut Creek Drainage." The text "Flow from the borrow ditch is routed through a culvert leading to surface water performance monitoring location SW055. Surface water flows from SW055 toward the South Interceptor Ditch (SID)," is currently in Section 2.5.2.

77

60	**Section 2.4.3, Surface Water Protection.** For surface water results - There are sample results for SW055 in the Quarterly Environmental Monitoring Report January – March 2002 (DOE, May 2002). There was no flow for GS42, GS52, GS53, or GS54 during that time, therefore no results are available. Please add the data from SW055 (Pu-239+240 was 3.160 pCi/l and Am-241 was 0.557 pCi/l). *Response: SW055 data is being discussed with the Surface Water Group.* CDPHE Response to Response: Please incorporate the newer data in the new section 2.5.2 and add a clarifying statement that other locations did not yield sufficient water for collection of samples, thus the reason that no data is available. Please show these locations on Figure 1.	Data received from the Site Surface Water Group indicated two samples were collected at SW055 on May 24, 2002, associated with a storm event. Results indicate that americium-241 was present at 0.088 pCi/L, plutonium-239/240 was present at 0.432 pCi/L, and uranium-238 was present at 0.063 pCi/L. Data from the Quarterly Environmental Monitoring Report January – March 2002 (DOE 2002) was not included in the draft Notification because the report stated that there was no flow at this location. The referenced results for SW055 are for a composite sample from May 28, 2001 to May 24, 2002. These data and the data from the May 24, 2002, sampling event were added to Table 4. The following text was added to the end of the third paragraph in Section 2.5.2: "because of drought conditions, there was no water to sample." The locations were added to Figure 1.

61	**Section 2.4.4, Monitoring**. Please present some information on VOC contamination in groundwater. *Response: There may be VOC impacts to groundwater, however, this Notification and Stewardship Evaluation pertain to radionuclide impacts.* CDPHE Response to Response: Suggest addition of clarifying statement to beginning of this section, such as 'Monitoring includes the following considerations relating to radionuclides. VOC impacts are deferred to the IM/IRA for the 903 Pad Lip Area.'	The following text was added to Section 2.5.3, Monitoring: "...considerations relating to radionuclides. VOC impacts will be addressed in the 903 Lip Area IM/IRA. Also, please see response to Comment 32.
62	**Section 2.4.5, Stewardship Actions and Recommendations.** Please identify potential BMPs to control run-off. *Response: BMPs are discussed in Section 7.2 of the ER RSOP.* CDPHE Response to Response: Provide a reference to Section 7.2 of the ER RSOP, and incorporate the statement included in your response.	The following text was added: "(...Section 7.2 of the ER RSOP [DOE 2002a])."
63	**Section 2.5, Accelerated Action Remediation Goals.** Are the second and fourth bullets one in the same. If there are changes made to the similar information at the end of Section 2.3, make sure the discussions are consistent. *Response: Done*	No additional response is required.

64	**Section 2.11, Project Schedule.** Add a projected end date to the project schedule or at least a projected period of time e.g., 6-months, for implementation of the accelerated action. *Response: Done*	No additional response is required.
65	**Figures 5, 6, and 7** – These maps show sum-of-ratio calculations for 25 sample locations within the 903 Pad. These calculations are apparently based on more data than is shown on Figures 2, 3, and 4, which show 24, 19 and 12 data points respectively. The discrepancy on the number of samples in the Figures and used for the sum of ratios needs to be corrected. *Response: Figures 2, 3, and 4 show only the data greater than background mean plus two standard deviations.* CDPHE Response to Response: Please provide a reference to the location of the missing data used for the sum of ratios.	A reference to the Characterization Report for the 903 Drum Storage Area, 903 Lip Area, and Americium Zone was added, as well as the following text: " The SORs presented on these figures are calculated from all data, while Figures 2, 3, and 4 present only data greater than the background means plus two standard deviations."

80

66	**Figures 5, 6, and 7** Additionally, the data shown on these maps and in other tables is compared to 1996 action levels, which will soon be updated with lower calculated values. It would be unwise and misleading to report these values without at least acknowledging that new action levels are pending. *Response: The data on these maps is compared to current RFCA Tier I and Tier II Action Levels as required by RFCA.* *CDPHE Response to Response: By not acknowledging or evaluating the impending implementation of new action levels, K-H/DOE are proceeding at risk.*	This is understood.
67	**Section 2.3** - When sum-of-ratio calculations are performed on the data in Figures 2, 3, and 4 using the anticipated new calculations, the results are considerably different than in Figures 5, 6, and 7. *Response: The SOR calculations are based on current RFCA Tier I and Tier II Action Levels as required by RFCA.* CDPHE Response to Response: By not acknowledging or evaluating the impending implementation of new action levels, K-H/DOE are proceeding at risk.	This is understood.

81

68	**Section 2.3** For Soil Horizon 1, the sum-of-ratios values for all but five sample locations exceed 1 when the new RSAL values are used. Three of those five do not report a Pu value and so may not be valid. For Soil Horizon 2, the new sum-of-ratios values exceed 1 at five locations. Since the Notification calls for removal of these two horizons, these additional exceedances may not be significant. However, the sum-of-ratios calculation at one sample location in Soil Horizon 3 exceeds 1 using the new action levels, which may require an additional lift in that spot and maybe others. *Response: The SOR calculations are based on current RFCA Tier I and Tier II Action Levels as required by RFCA.* *CDPHE Response to Response: By not acknowledging or evaluating the impending implementation of new action levels, K-H/DOE are proceeding at risk.*	This is understood.
69	**Section 2.3** – The 5th bullet in the list of proposed actions at the end of this section should state: "Regrade <u>with clean soil</u> and revegetate." *Response: This bullet was changed to the following "Backfill with clean soil, regrade, and revegetate."*	No additional response is required.

82

70	**Section 2.4.3** – At least one sample location reported in Table 3 and in Figure 2 indicates a U-238 Tier I exceedance (780 pCi/g), contrary to the statement that, "Uranium-238 activity is greater than RFCA Tier II ALs in surface soil." Again, this statement ignores the pending, newly calculated RSALs. *Response: The data is compared to current RFCA Tier I and Tier II Action Levels as required by RFCA.* CDPHE Response to Response: By not acknowledging or evaluating the impending implementation of new action levels, K-H/DOE are proceeding at risk.	This is understood.
71	**Section 2.4.3** – The sentence just above Table 4 states that the results of the sampling at the new surface water stations are not yet available. If they are now available, they should be added or summarized here. *Response: SW055 data is being discussed with the Surface Water Group.*	Please see response to Comment 60.
72	**Section 2.4.4** – The sentence after Table 5 should state, "Groundwater quality in this area has been impacted by contamination from IHSS 112." *Response: The 903 Pad area may not be the only source.*	No additional response is required.

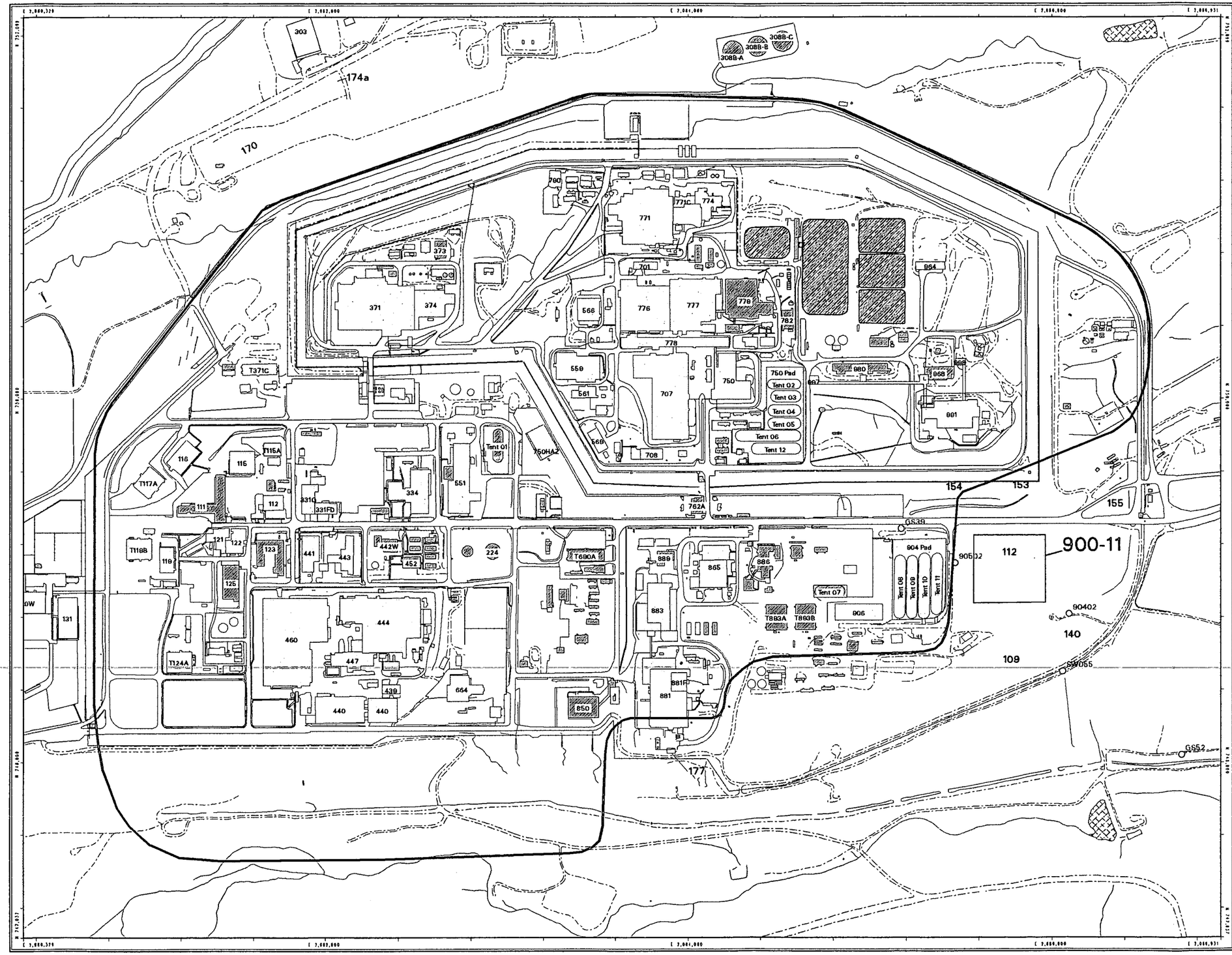
83

73	**Section 2.5** – Another remedial action objective could be added to the standard 3 objectives in the ER RSOP: "4. Provide a remedy that is consistent with the anticipated future land use at the Site." *Response: The RAOs in Section 2.5 are the ER RSOP RAOs not the accelerated action RAO.* CDPHE Response to Response: Please revisit the comment and consider adding the suggested RAO for this accelerated action.	The RAOs in Section 2.5 are the ER RSOP RAOs, not the accelerated action RAO. The suggested RAO is not consistent with RFCA. Therefore, adding this additional RAO is not appropriate.
	Additional Comments	
74	Section 2.5.2, Table 3 – U238 exceeds Tier I as well. Please correct paragraph above.	The text was changed to the following: "Additionally, uranium-238 activity is greater than the RFCA Tier I AL in surface soil."
75	Section 2.5.4, Stewardship Actions and Recommendations. Add that LTS will include groundwater and surface water monitoring to demonstrate that remedial/removal actions have successfully met protection of HH&E.	The following text has been added: "Review of groundwater and surface water monitoring stations near IHSS Group 900-112 when long-term monitoring options are evaluated."
76	Section 2.5, Stewardship. Please provide discussion relative to ALARA process or provide reference to the ALARA process to be implemented.	The ALARA process is described in ER RSOP, Section 5.5. A reference to the ER RSOP ALARA section was added to the remediation plan in Section 2.3 and the accelerated action goals in Section 2.6.

84

77	Confirmation Sampling. For the discussion regarding collection of confirmation samples in the center of each subarea, modify to state that confirmation samples will be collected from each subarea, if that is what the final evaluation on confirmation sampling reveals.	The phrase "in-process" was added to the second sentence in fourth paragraph of Section 2.3 before the word 'confirmation'. The following text was added after the second sentence in the fourth paragraph of Section 2.3: "A confirmation sample will be collected in the location of the additional excavation."

Figure 1
IA Groups Location Map



EXPLANATION

- Proposed 2002 IHSS112 Groundwater Monitoring Wells
- Surface Water Sampling Location

IHSS Groupings

- 900-11 (only IHSS 112)

Standard Map Features

- Buildings and other structures
- Demolished buildings
- Solar Evaporation Ponds (SEPs)
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Paved roads
- Dirt roads
- Industrial Area Operable Unit Boundary

DATA SOURCE BASE FEATURES:
PACs
Historical Release Report (HRR)
2nd Annual Update
Sept. 30, 1997
Individual Hazardous Substance Sites (IHSS)
DOE, 1992, HRR Report and Subsequent Updates.
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas.
Digitized from the orthophotographs. 1/95

N

Scale = 1 : 6530
1 inch represents approximately 544 feet

150 0 300 600ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

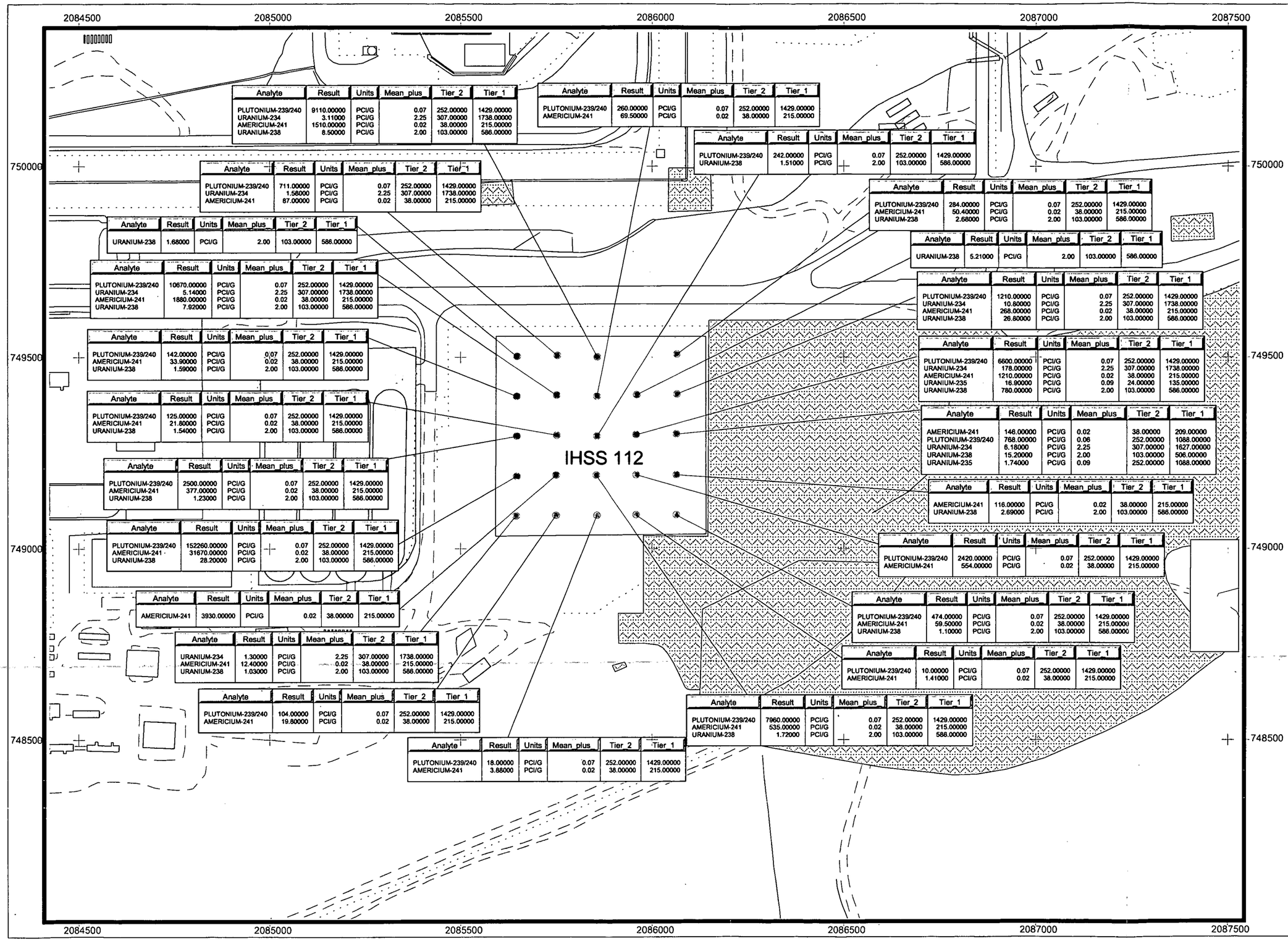
Prepared by: DynCorp — THE ART OF TECHNOLOGY

Prepared for: KAISER-HILL COMPANY

January 07, 2003

N:_Svr w:/projects/ias/notifications/fy2003/903pad/ia_group_ihss112_final.aml

Figure 2
Native Soil Horizon 1
Approximately 0-6"
Exisiting Sampling Data
Greater Than Background
Plus 2 Standard Deviations



Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	9110.00000	PCI/G	0.07	252.00000	1429.00000
URANIUM-234	3.11000	PCI/G	2.25	307.00000	1738.00000
AMERICIUM-241	1510.00000	PCI/G	0.02	38.00000	215.00000
URANIUM-238	8.50000	PCI/G	2.00	103.00000	586.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	260.00000	PCI/G	0.07	252.00000	1429.00000
AMERICIUM-241	69.50000	PCI/G	0.02	38.00000	215.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	242.00000	PCI/G	0.07	252.00000	1429.00000
URANIUM-238	1.51000	PCI/G	2.00	103.00000	586.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	711.00000	PCI/G	0.07	252.00000	1429.00000
URANIUM-234	1.58000	PCI/G	2.25	307.00000	1738.00000
AMERICIUM-241	87.00000	PCI/G	0.02	38.00000	215.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	284.00000	PCI/G	0.07	252.00000	1429.00000
AMERICIUM-241	50.40000	PCI/G	0.02	38.00000	215.00000
URANIUM-238	2.68000	PCI/G	2.00	103.00000	586.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
URANIUM-238	1.68000	PCI/G	2.00	103.00000	586.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
URANIUM-238	5.21000	PCI/G	2.00	103.00000	586.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	10670.00000	PCI/G	0.07	252.00000	1429.00000
URANIUM-234	5.14000	PCI/G	2.25	307.00000	1738.00000
AMERICIUM-241	1880.00000	PCI/G	0.02	38.00000	215.00000
URANIUM-238	7.92000	PCI/G	2.00	103.00000	586.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	1210.00000	PCI/G	0.07	252.00000	1429.00000
URANIUM-234	10.80000	PCI/G	2.25	307.00000	1738.00000
AMERICIUM-241	268.00000	PCI/G	0.02	38.00000	215.00000
URANIUM-238	26.80000	PCI/G	2.00	103.00000	586.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	142.00000	PCI/G	0.07	252.00000	1429.00000
AMERICIUM-241	33.90000	PCI/G	0.02	38.00000	215.00000
URANIUM-238	1.59000	PCI/G	2.00	103.00000	586.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	6600.00000	PCI/G	0.07	252.00000	1429.00000
URANIUM-234	178.00000	PCI/G	2.25	307.00000	1738.00000
AMERICIUM-241	1210.00000	PCI/G	0.02	38.00000	215.00000
URANIUM-235	16.90000	PCI/G	0.09	24.00000	135.00000
URANIUM-238	780.00000	PCI/G	2.00	103.00000	586.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	125.00000	PCI/G	0.07	252.00000	1429.00000
AMERICIUM-241	21.80000	PCI/G	0.02	38.00000	215.00000
URANIUM-238	1.54000	PCI/G	2.00	103.00000	586.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
AMERICIUM-241	146.00000	PCI/G	0.02	38.00000	209.00000
PLUTONIUM-239/240	768.00000	PCI/G	0.06	252.00000	1088.00000
URANIUM-234	6.18000	PCI/G	2.25	307.00000	1627.00000
URANIUM-238	15.20000	PCI/G	2.00	103.00000	506.00000
URANIUM-235	1.74000	PCI/G	0.09	252.00000	1088.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	2500.00000	PCI/G	0.07	252.00000	1429.00000
AMERICIUM-241	377.00000	PCI/G	0.02	38.00000	215.00000
URANIUM-238	1.23000	PCI/G	2.00	103.00000	586.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
AMERICIUM-241	116.00000	PCI/G	0.02	38.00000	215.00000
URANIUM-238	2.69000	PCI/G	2.00	103.00000	586.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	152260.00000	PCI/G	0.07	252.00000	1429.00000
AMERICIUM-241	31670.00000	PCI/G	0.02	38.00000	215.00000
URANIUM-238	28.20000	PCI/G	2.00	103.00000	586.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	2420.00000	PCI/G	0.07	252.00000	1429.00000
AMERICIUM-241	554.00000	PCI/G	0.02	38.00000	215.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
AMERICIUM-241	3930.00000	PCI/G	0.02	38.00000	215.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	474.00000	PCI/G	0.07	252.00000	1429.00000
AMERICIUM-241	59.50000	PCI/G	0.02	38.00000	215.00000
URANIUM-238	1.10000	PCI/G	2.00	103.00000	586.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
URANIUM-234	1.30000	PCI/G	2.25	307.00000	1738.00000
AMERICIUM-241	12.40000	PCI/G	0.02	38.00000	215.00000
URANIUM-238	1.03000	PCI/G	2.00	103.00000	586.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	10.00000	PCI/G	0.07	252.00000	1429.00000
AMERICIUM-241	1.41000	PCI/G	0.02	38.00000	215.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	104.00000	PCI/G	0.07	252.00000	1429.00000
AMERICIUM-241	19.80000	PCI/G	0.02	38.00000	215.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	7960.00000	PCI/G	0.07	252.00000	1429.00000
AMERICIUM-241	535.00000	PCI/G	0.02	38.00000	215.00000
URANIUM-238	1.72000	PCI/G	2.00	103.00000	586.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	18.00000	PCI/G	0.07	252.00000	1429.00000
AMERICIUM-241	3.88000	PCI/G	0.02	38.00000	215.00000

KEY

- IHSS 112
- IHSS
- PAC
- Building or other structure
- Stream, ditch, or other drainage
- Paved area
- Fence
- Dirt Road
- Existing Sampling Location

N

Scale =1:2,100

60 0 60 120 180 Feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

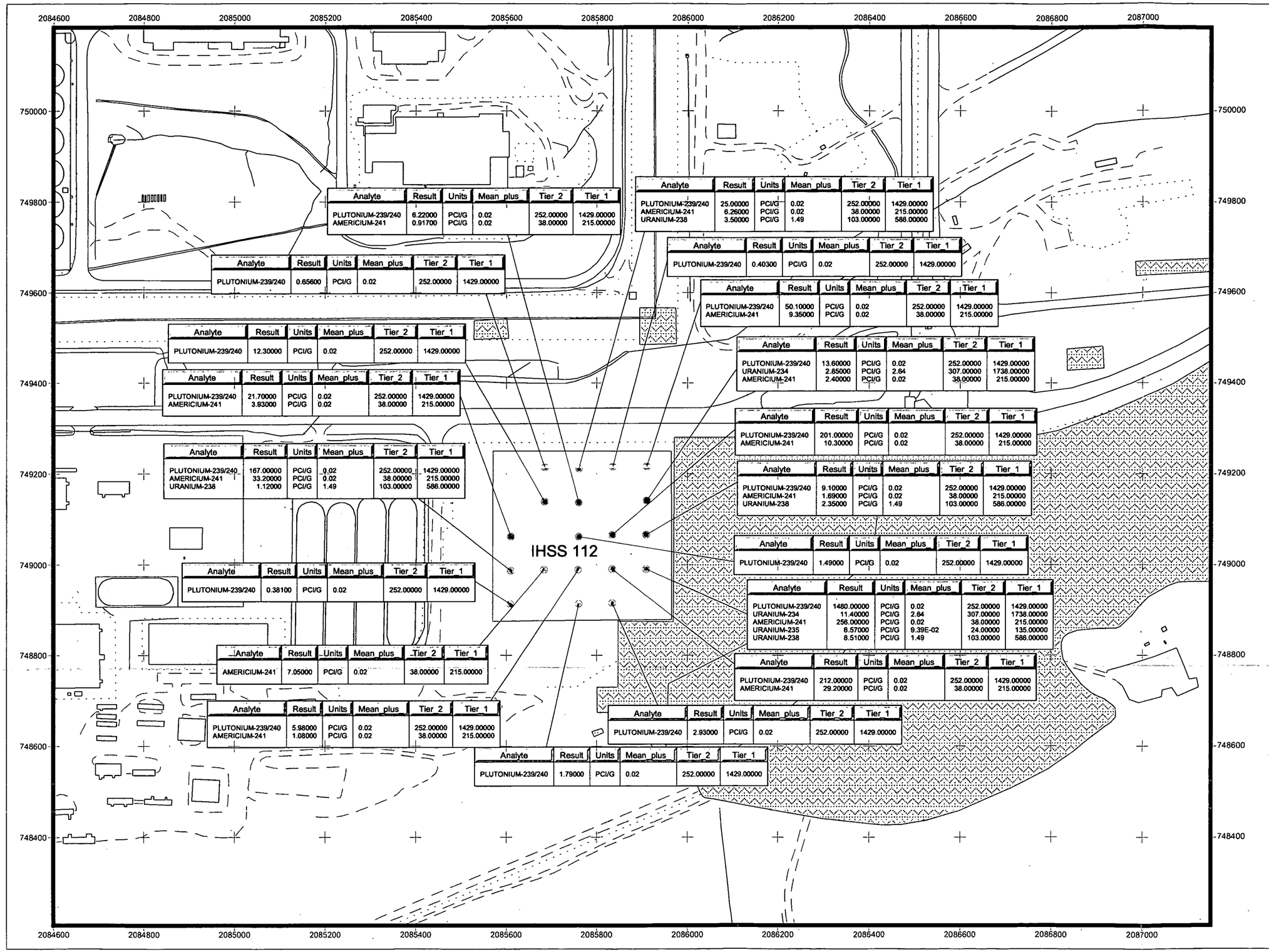
Prepared by:

KAISER•HILL COMPANY

c:/radms/serrezes/903/903padcharacterization.apr

8

Figure 3
Native Soil Horizon 2
6" - 12"
Exisiting Sampling Data
Greater Than Background
Plus 2 Standard Deviations



Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	6.22000	PCI/G	0.02	252.00000	1429.00000
AMERICIUM-241	0.91700	PCI/G	0.02	38.00000	215.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	0.65600	PCI/G	0.02	252.00000	1429.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	12.30000	PCI/G	0.02	252.00000	1429.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	21.70000	PCI/G	0.02	252.00000	1429.00000
AMERICIUM-241	3.93000	PCI/G	0.02	38.00000	215.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	167.00000	PCI/G	0.02	252.00000	1429.00000
AMERICIUM-241	33.20000	PCI/G	0.02	38.00000	215.00000
URANIUM-238	1.12000	PCI/G	1.49	103.00000	586.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	0.38100	PCI/G	0.02	252.00000	1429.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
AMERICIUM-241	7.05000	PCI/G	0.02	38.00000	215.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	5.98000	PCI/G	0.02	252.00000	1429.00000
AMERICIUM-241	1.08000	PCI/G	0.02	38.00000	215.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	1.79000	PCI/G	0.02	252.00000	1429.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	25.00000	PCI/G	0.02	252.00000	1429.00000
AMERICIUM-241	6.26000	PCI/G	0.02	38.00000	215.00000
URANIUM-238	3.50000	PCI/G	1.49	103.00000	586.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	0.40300	PCI/G	0.02	252.00000	1429.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	50.10000	PCI/G	0.02	252.00000	1429.00000
AMERICIUM-241	9.35000	PCI/G	0.02	38.00000	215.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	13.60000	PCI/G	0.02	252.00000	1429.00000
URANIUM-234	2.85000	PCI/G	2.64	307.00000	1738.00000
AMERICIUM-241	2.40000	PCI/G	0.02	38.00000	215.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	201.00000	PCI/G	0.02	252.00000	1429.00000
AMERICIUM-241	10.30000	PCI/G	0.02	38.00000	215.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	9.10000	PCI/G	0.02	252.00000	1429.00000
AMERICIUM-241	1.69000	PCI/G	0.02	38.00000	215.00000
URANIUM-238	2.35000	PCI/G	1.49	103.00000	586.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	1.49000	PCI/G	0.02	252.00000	1429.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	1480.00000	PCI/G	0.02	252.00000	1429.00000
URANIUM-234	11.40000	PCI/G	2.64	307.00000	1738.00000
AMERICIUM-241	256.00000	PCI/G	0.02	38.00000	215.00000
URANIUM-235	6.57000	PCI/G	9.39E-02	24.00000	135.00000
URANIUM-238	8.51000	PCI/G	1.49	103.00000	586.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	212.00000	PCI/G	0.02	252.00000	1429.00000
AMERICIUM-241	29.20000	PCI/G	0.02	38.00000	215.00000

Analyte	Result	Units	Mean_plus	Tier_2	Tier_1
PLUTONIUM-239/240	2.93000	PCI/G	0.02	252.00000	1429.00000

KEY

- IHSS 112
- IHSS
- PAC
- Building or other structure
- Stream, ditch, or other drainage
- Paved area
- Fence
- Dirt Road
- Existing Sampling Location

N

Scale =1:2,500

50 0 50 100 150 200 Feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by:

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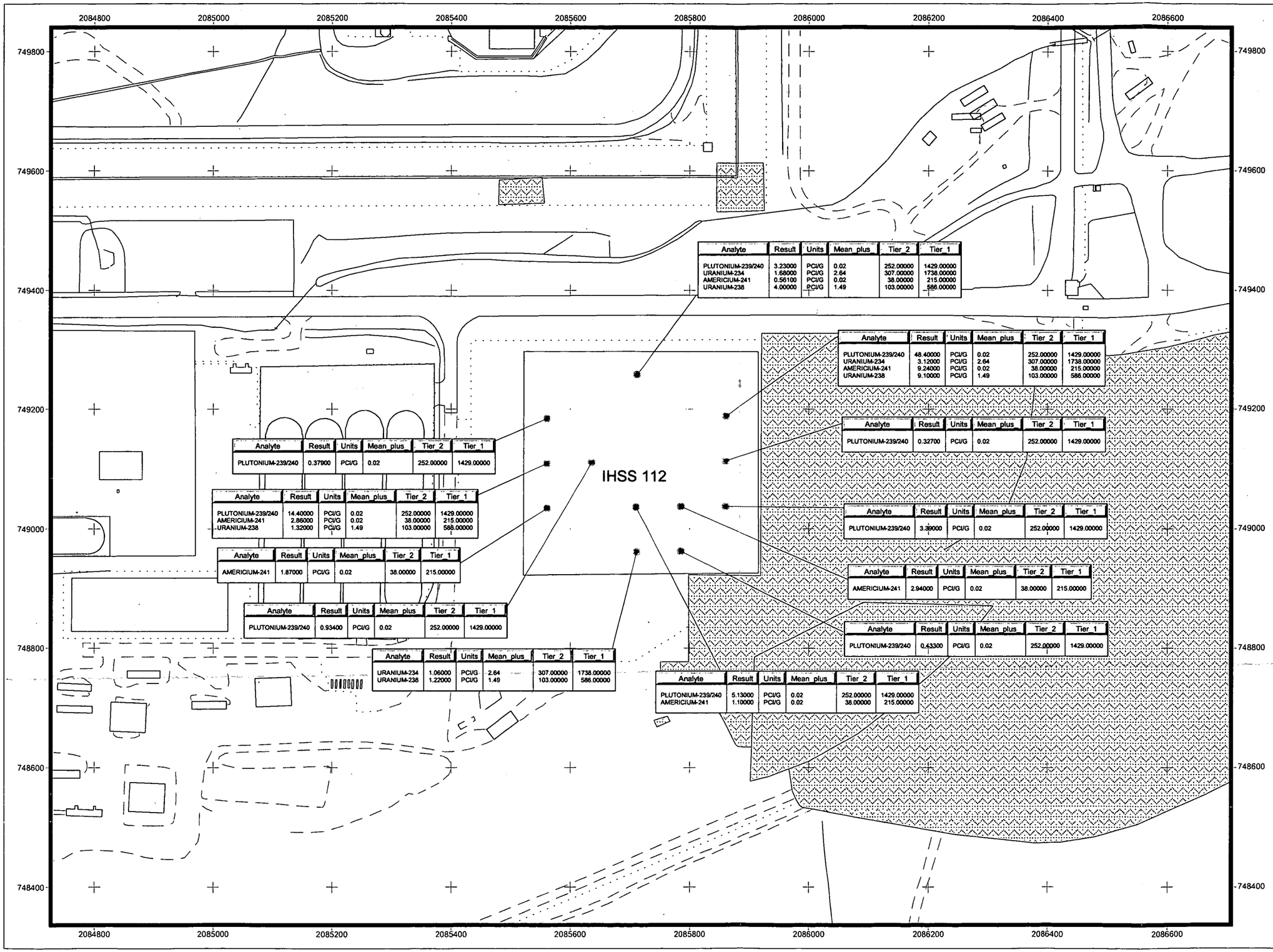
c:radms/sarrezes/903/903padcharacterization.apr

9

Figure 4
Native Soil Horizon 3
Approximately 12" to 18"
Exisiting Sampling Data
Greater Than Background
Means Plus 2 Standard Deviations



KEY

- IHSS 112
- IHSS
- PAC
- Building or other structure
- Stream, ditch, or other drainage
- Paved area
- Fence
- Dirt Road
- Existing Sampling Location

N

Scale =1:1,900

40 0 40 80 120 160 Feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

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c:/radms/serrezes/903/903padcharacterization.apr

10

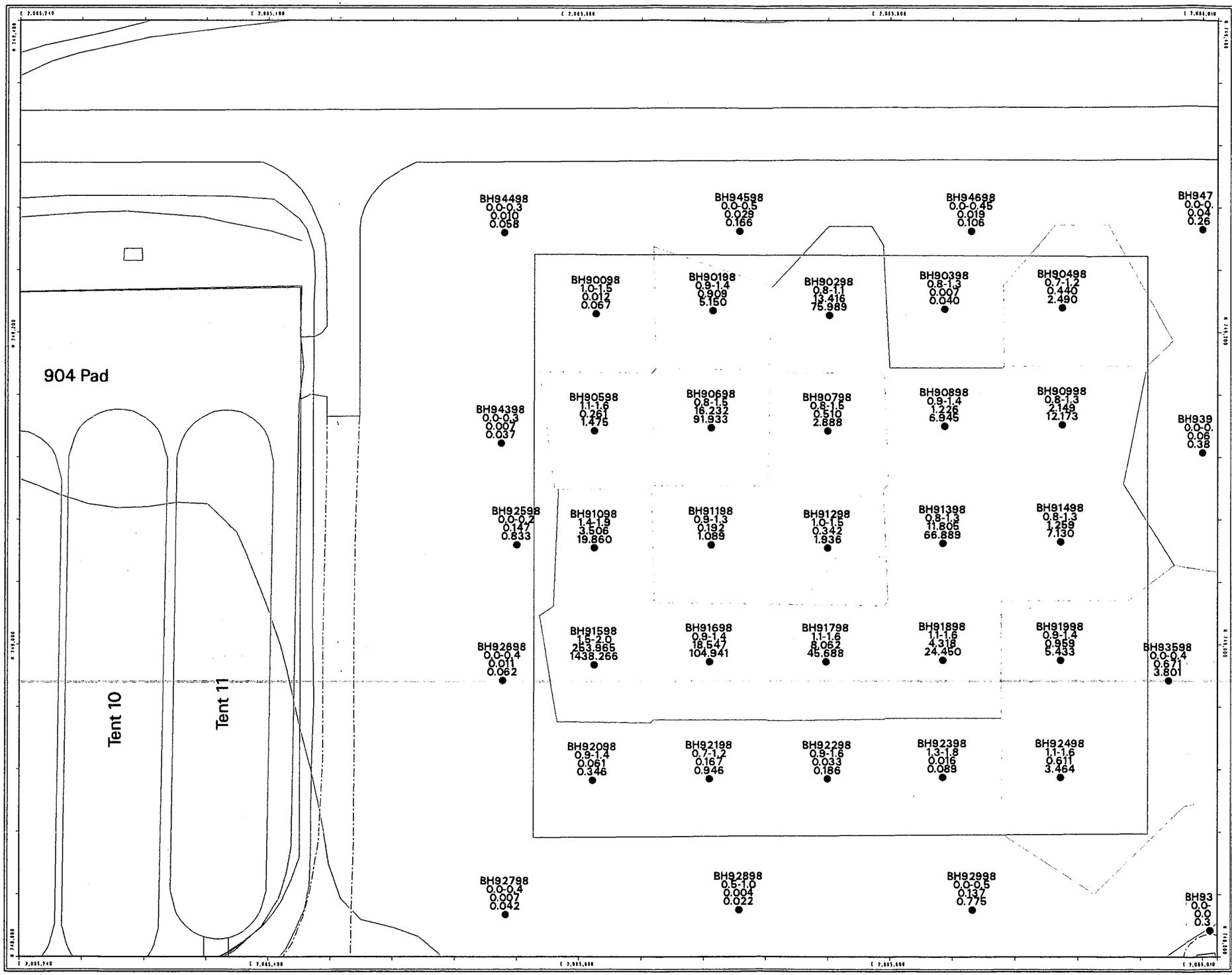

Figure 5

Native Soil Horizon 1

RFCA Tier I and Tier II Sum of Ratio Exceedances

EXPLANATION

Boreholes locations

- Location
  Sample Depth (ft.)
  Tier I Sum of Ratio
  Tier II Sum of Ratio
- Exceeds Tier I SOR
- Exceeds Tier II SOR

Standard Map Features

- Buildings and other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Topographic Contour (20-Foot)
- Paved roads
- Dirt roads

DATA SOURCE BASE FEATURES:
Buildings, fences, hydrography, roads and other structures from 1994 aerial flyover data captured by EG&G RSI, Las Vegas. Digitized from the orthophotographs, 1/35
Topographic contours were derived from digital elevation model (DEM) data by Merrick Kruckon (MK) using ESRI Arc TIN and LATTICE to process the DEM data to create 5-foot contours. The DEM data was captured by the Remote Sensing Lab, Las Vegas, NV, 1994 Aerial Flyovers at ~ 10 meter resolution. DEM post-processing performed by MK, Winter 1997.

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Scale = 1 : 770
1 inch represents approximately 64 feet

20 0 40 80 Ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
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GIS Dept. 303-966-7707

Prepared by: DynCorp — THE ART OF TECHNOLOGY

Prepared for: KAISER•HILL COMPANY

January 07, 2003

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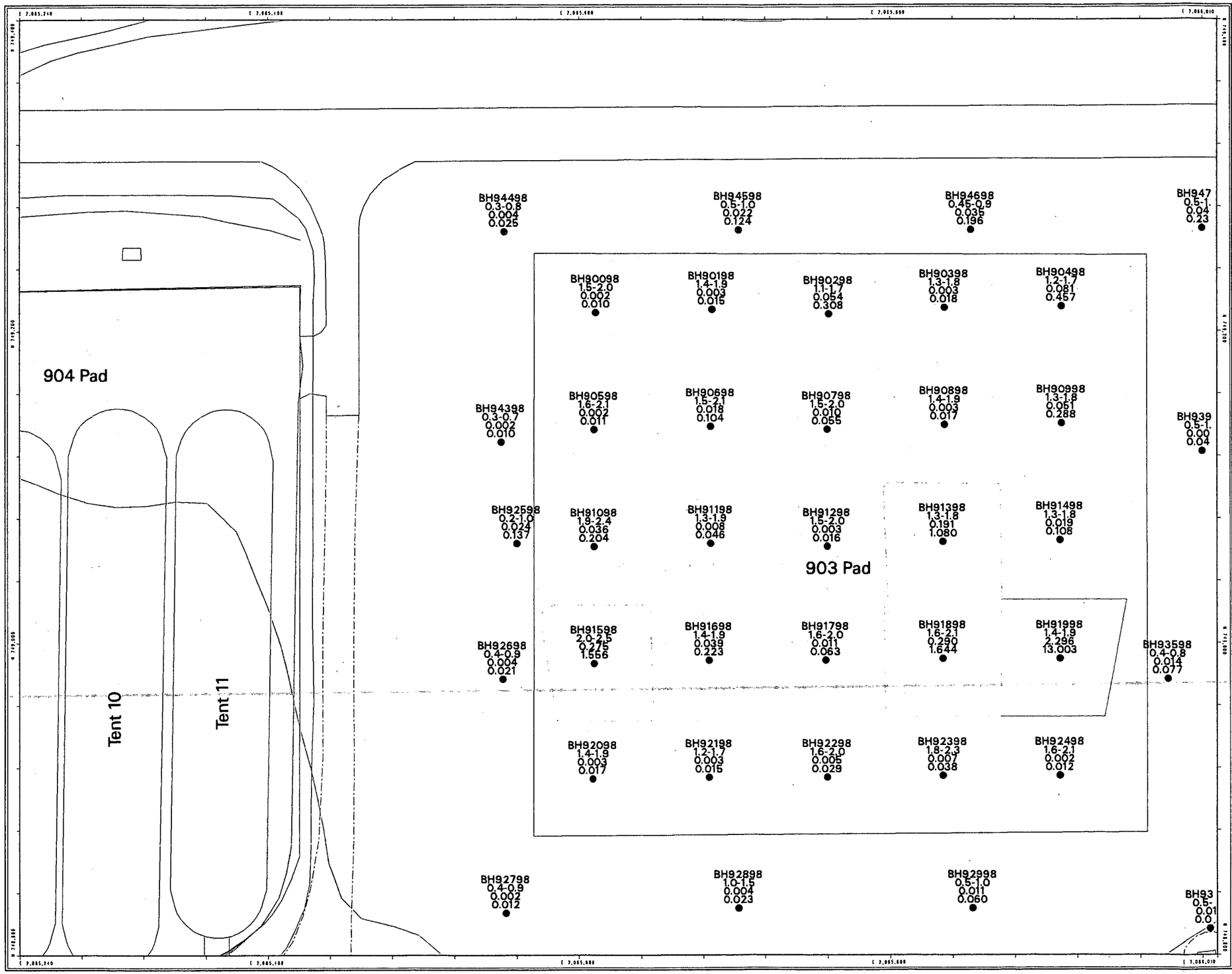

Figure 6

Native Soil Horizon 2

RFCA Tier I and Tier II Sum of Ratio Exceedances

EXPLANATION

Boreholes locations

- Location
  Sample Depth (ft.)
  Tier I Sum of Ratio
  Tier II Sum of Ratio
- Exceeds Tier I SOR
- Exceeds Tier II SOR

Standard Map Features

- Buildings and other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Topographic Contour (20-Foot)
- Paved roads
- Dirt roads

DATA SOURCE BASE FEATURES:
Buildings, fences, hydrography, roads and other structures from 1994 aerial flyover data captured by EG&G RSL, Las Vegas. Digitized from the orthophotographs. 1/95
Topographic contours were derived from digital elevation model (DEM) data by Merrick Knudsen (MK) using ESRI Arc TIN and LATTICE to process the DEM data to create 5-foot contours. The DEM data was captured by the Remote Sensing Lab, Las Vegas, NV, 1994 Aerial Flyovers at ~ 10 meter resolution. DEM post-processing performed by MK, Winter 1997.

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Scale = 1 : 770
1 inch represents approximately 64 feet

20 0 40 80 ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

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January 07, 2003

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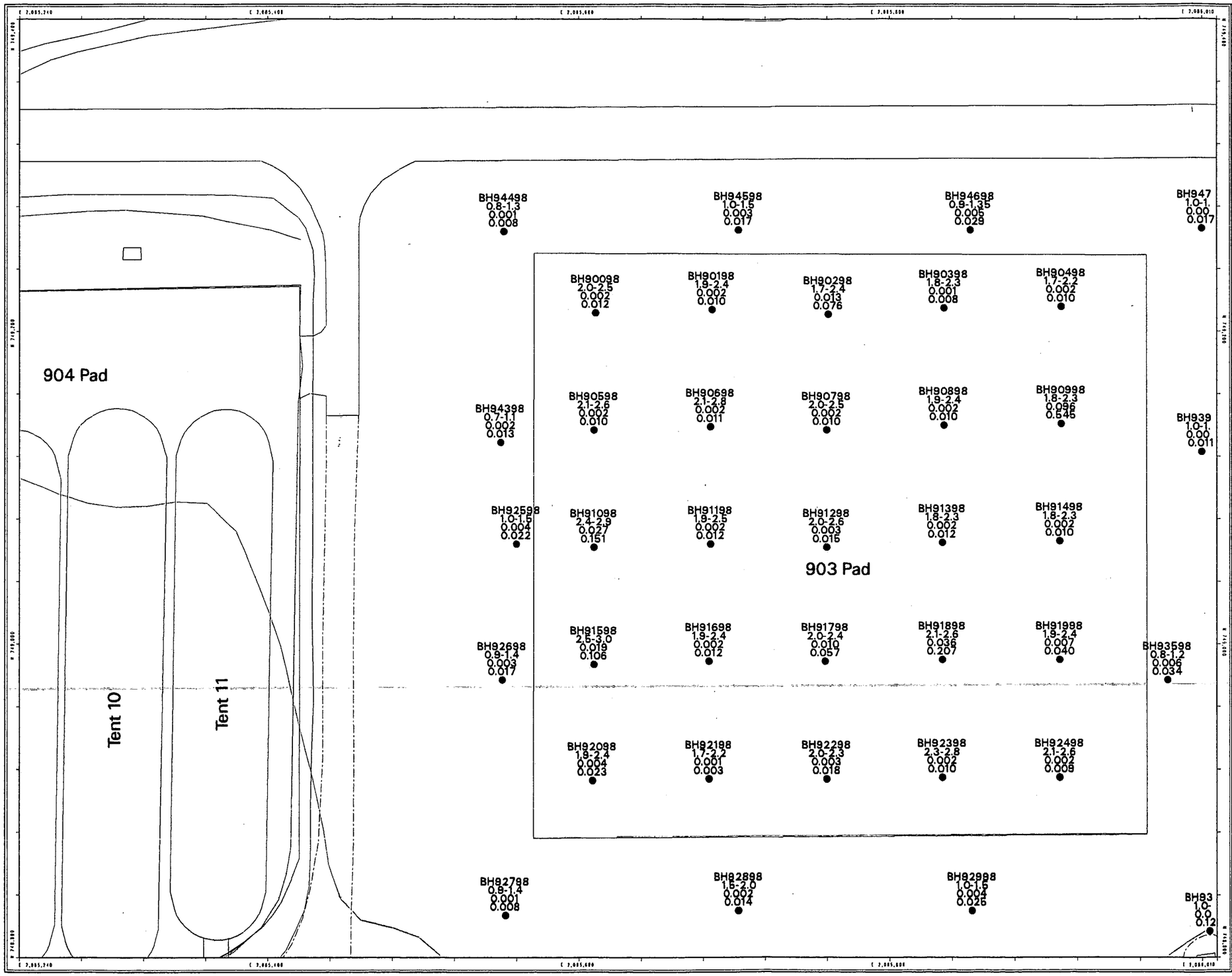

Figure 7

Native Soil Horizon 3

RFCA Tier I and Tier II Sum of Ratio Exceedances

EXPLANATION

Boreholes locations

- Location
  Sample Depth (ft.)
  Tier I Sum of Ratio
  Tier II Sum of Ratio
- Exceeds Tier I SOR
- Exceeds Tier II SOR

Standard Map Features

- Buildings and other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Topographic Contour (20-Foot)
- Paved roads
- Dirt roads

DATA SOURCE BASE FEATURES:
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas. Digitized from the orthophotographs. 1/95
Topographic contours were derived from digital elevation model (DEM) data by Morrison Knudson (MK) using ESRI Arc TIN and LATTICE to process the DEM data to create 5-foot contours. The DEM data was captured by the Remote Sensing Lab, Las Vegas, NV, 1994 Aerial Photos at ~ 10 meter resolution. DEM post-processing performed by MK, Winter 1997.

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Scale = 1 : 770
1 inch represents approximately 64 feet

20 0 40 80 Ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

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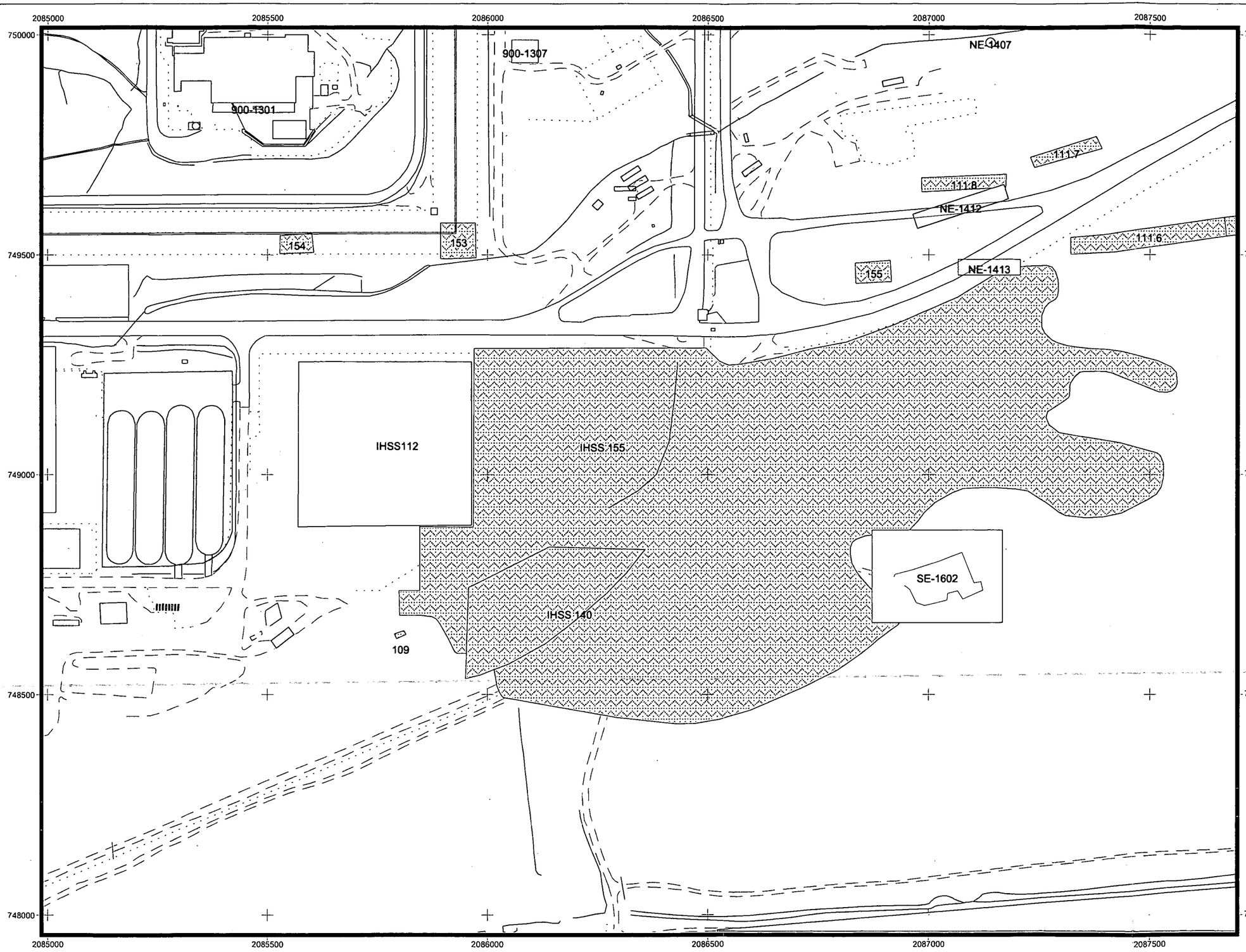

Figure 9
IHSS Group 900-11 IHSS 112
Remediation Area

KEY

- IHSS 112 Remediation Area
- Nearby IHSSs
- PAC
- Stream, ditch, or other drainage
- Paved area
- Fence
- Dirt road

N

Scale = 1:2600

80 0 80 160 Feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

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c:radms/serrezes/903/900-112 notification.apr

22

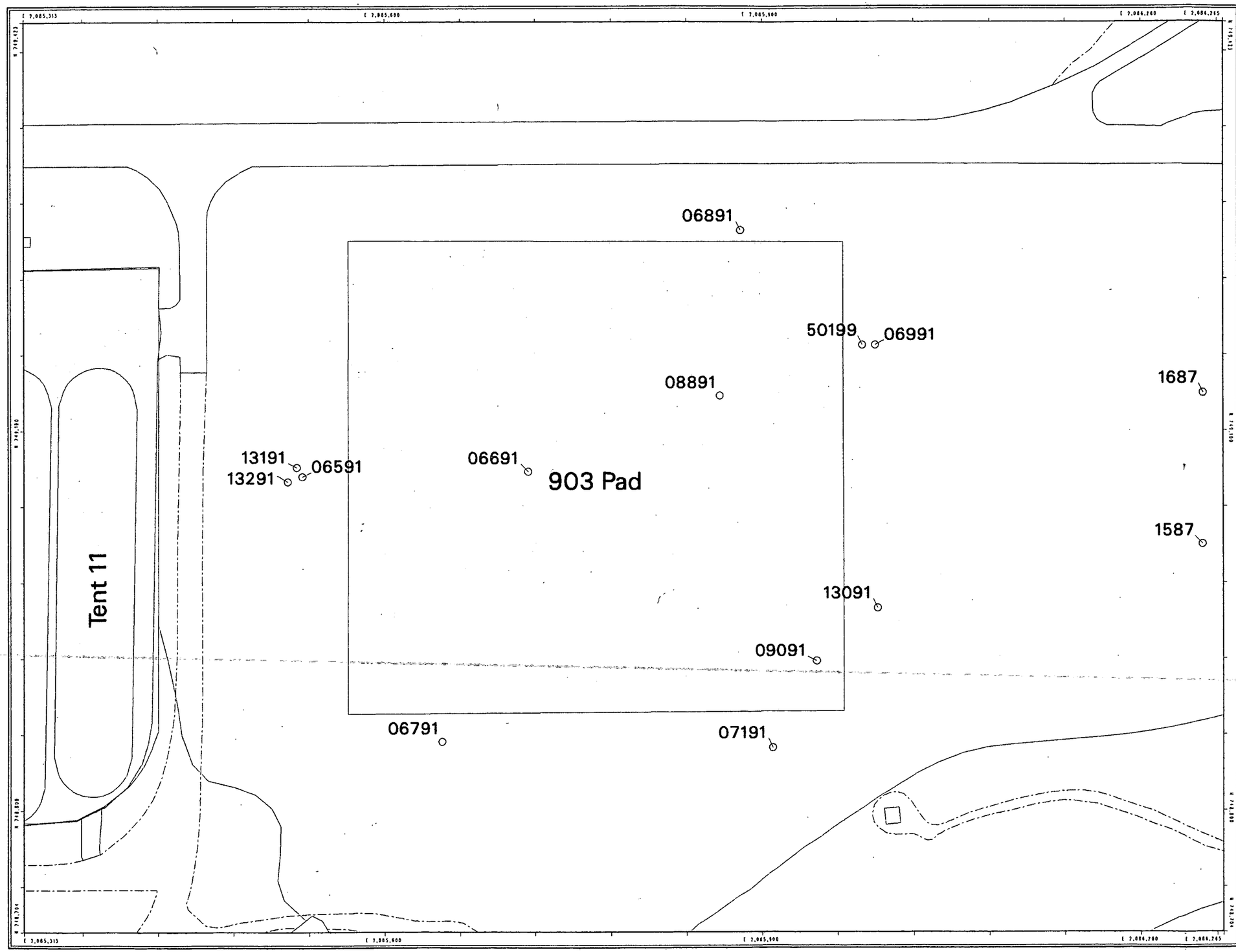

Figure 10

903 Pad Area Wells

EXPLANATION

○ IMP Wells Removed

Standard Map Features

- Buildings and other structures
- Fences and other barriers
- Topographic Contour (20-Foot)
- Paved roads
- Dirt roads

DATA SOURCE BASE FEATURES:
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas. Digitized from the orthophotographs. 1/95

Topographic contours were derived from digital elevation model (DEM) data by Morrison Knudsen (MK) using ESRI Arc TIN and LATTICE to process the DEM data to create 5-foot contours. The DEM data was captured by the Remote Sensing Lab, Las Vegas, NV, 1994 Aerial Flyover at ~ 10 meter resolution. DEM post-processing performed by MK, Winter 1997.

N

Scale = 1 : 930
1 inch represents approximately 78 feet

25 0 50 100ft

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NT_Svr w:/projects/ias/notifications/fy2003/903pad/pad903_imp_wells.aml